

# Preparation of the pediatric patient

T. PIROTTE and F. VEYCKEMANS

**Summary** : Preparing a child for a short stay in the hospital involves the evaluation of its health status and its psychological preparation but also providing clear instructions for perioperative care to its parents. The success depends on the professionalism, flexibility and teaching skills of a dedicated team.

**Key words** : Preoperative examination ; Psychological preparation ; One-day.

## INTRODUCTION

Preparing a pediatric patient for a short stay in the hospital, either for outpatient anesthesia or for same-day admission, involves different goals (1) :

- the evaluation of the child's health status
- its psychological preparation to this experience
- the instruction of parents regarding pre- and postoperative events as well as completion of administrative paperwork concerning their child's admission to the hospital
- if required, the coordination of laboratory and/or specialized testing.

### 1. Evaluation of the child's health status (2)

This is performed during the pre-anesthetic medical examination. Its goals are :

- to evaluate the child's actual health status
- to detect any unknown pathology that could modify the anesthetic technique or risk, such as a coagulation problem or a subclinical myopathy
- and sometimes to obtain a reference value that could be useful during the foreseen procedure (e.g., hemoglobin level).

In clinical practice, two situations are encountered :

- the apparently healthy child
- the child with a known pathology (epilepsy, asthma, metabolic disease..) : in this case, contact should be taken with the child's usual doctor to decide which special precautionary measures should be taken during the perioperative period.

Whether this evaluation can be done by anesthesiologists or other health care providers (pediatrician, surgeon etc... ) is a matter of controversy : in fact, most of the latter do not have in-dept knowledge of anesthetic procedures, techniques and risks. In our opinion, the preoperative evaluation should be performed by an anesthesiologist because it is an unique opportunity

- to meet the child and its parents in a less stressful atmosphere than the day of surgery
- to perform an anesthesia-orientated clinical examination
- to explain what can or will be done and to obtain the parents', and if possible the child's, informed consent regarding the techniques that will be used (e.g., intravenous induction, caudal block ...).

But a specialized pediatric advice (e.g. cardiology) should of course be quickly available if the anesthesiologist's clinical examination uncovers an abnormality.

Ideally, the pre-anesthetic medical evaluation should be performed one or two weeks before the procedure. This time-interval needs to be short because instructions and teaching provided close to the day of surgery have a greater likelihood of being followed but long enough to give the opportunity to obtain a specialized advice.

The parents should also be warned that their child's history and physical examination will be quickly updated on the day of admission and that last minute cancellation remains possible if any new finding could jeopardize its safe anesthetic management.

#### 1.1. History

The following points should be investigated :

- birth : at term ? premature ? any problems ? If the infant was born prematurely, its postconceptual

T. PIROTTE, M.D., F. VEYCKEMANS, M.D., Service d'Anesthésiologie, Cliniques universitaires St Luc, Avenue Hippocrate 10-1821, 1200 Bruxelles.

Table 1

## Pediatric preoperative clinical examination

<p>1) <i>general</i> :</p> <ul style="list-style-type: none"> <li>* inspection during the parental interview : breathing difficulties, cough <ul style="list-style-type: none"> <li>palor, cyanosis</li> <li>abnormal gait, hypotonia ?</li> </ul> </li> <li>* cardiopulmonary auscultation</li> <li>* abdominal palpation</li> <li>* body weight</li> <li>* blood pressure with an adapted BP cuff.</li> </ul> <p>2) <i>anesthesia-oriented</i></p> <ul style="list-style-type: none"> <li>* possible difficult airway management or trachea intubation ? <ul style="list-style-type: none"> <li>– mouth opening</li> <li>– size of the mandibular compartment : retrognathism ?</li> <li>– tongue size relative to the volume of the pharynx</li> <li>– neck mobility : reduced or excessive (hyperlaxity or subluxation)</li> <li>– shape and size of the mandible</li> <li>– Mallampati score in children over 7 years of age</li> <li>– facial morphology : facial asymetry, external ear anomalies or preauricular appendages ?</li> </ul> </li> <li>* teeth : loose teeth ? orthodontic fittings</li> <li>* venous access</li> <li>* if a locoregional block is foreseen : local surface anatomy</li> </ul>
--

age should be calculated : there is a risk of postoperative apnea if the postconceptual age is less than 60 weeks, although this risk decreases dramatically after 44 weeks if there is no neurological abnormality.

- previous operations ?
- allergies : latex, antibiotics...
- exposure to tobacco : passive exposure to tobacco increases the risk of perioperative respiratory problems, mainly laryngospasm and cough (3)
- recent upper or lower airway infection ?
- a history of recent bronchiolitis often means the presence of lower airway hypereactivity for up to 12 months following the initial infection
- in adolescent girls : any possibility of pregnancy ?

Familial history : abnormal bleeding, unexplained death under anesthesia, prolonged postoperative ventilation...

### 1.2. Clinical examination

The different components of the pediatric anesthesia-orientated clinical examination are summarized in table 1.

### 1.3. Laboratory

Provided history and clinical examination are normal, no systematic blood sampling is required (2, 4). Laboratory tests should be performed only if

their result could influence the anesthetic management.

However, the coagulation history is unreliable in the small child and knowing that the incidence of von Willebrand disease is approximately 1/1000 in our population, we presently use the algorithm described in table 2 in our department.

Moreover, two special issues are worth mentioning :

- the child presenting with a single ventricle cyanotic cardiac disease is prone to perioperative thromboembolic complications (5) : possible antithrombotic prophylaxis should be discussed with the hematologist
- the child presenting with a large venous malformation should undergo a specialized coagulation screening because local consumption of coagulation factors and/or fibrinolysis is not usual and should be controlled before operating the lesion.

### 1.4. Chest X-ray and EKG

A chest X-ray should be obtained if pulmonary auscultation is abnormal or to exclude the presence of a paucisymptomatic mediastinal mass in a child with fever and large lymph nodes.

A preoperative EKG should be performed in case of

- rythm abnormality during auscultation ;
- history of cardiac surgery if no recent cardiac follow up has been done : intracardiac conduction defect ? ventricular hypertrophy ?
- history of cardiotoxic chemotherapy (adriamycin, idamycin or daunorubicin) or mediastinal radiotherapy if no recent cardiac follow up has been done : in these cases, an evaluation of the cardiac function (echocardiography, radionuclide study) is mandatory (7)
- presence of a muscular disease (myotonia, myopathy) if no cardiac investigation has been done yet
- history of malaise or loss of consciousness if no cardiac investigation has been done yet : long QT, Wolf-Parkinson-White...
- history of congenital deafness if no cardiac investigation has been done yet : long QT ?

### 1.5. Special cases

#### a) Upper airway infection

Upper airway infection increases the risk of respiratory complications during and after general anesthesia : obstruction, laryngospasm, bronchospasm, atelectasis, hypoxemia... In case of elective

Table 2

Preoperative coagulation screening in pediatric patients

* <i>Less than 2 years-old</i>		
<u>Personal and / or familial history</u>		
↓		↓
negative		positive
platelets		platelets
INR, TT, aPTT, fibrinogen		INR, TT, aPTT, fibrinogen
		+ PFA-100
		+ measurement of specific factors according to results
* <i>More than 2 years-old</i>		
<u>Personal and / or familial history</u>		
↓		↓
negative		positive
↓		↓
previous coagulation screen ?		platelets
↓	↓	↓
		INR, TT, aPTT, fibrinogen
		+ PFA-100
		+ measurement of specific factors according to results
normal	none	
↓	↓	
no blood sample	only if surgery at risk for hemorrhage : platelets	
	INR, TT, aPTT, fibrinogen	

procedure, the attitude currently recommended is to proceed if infection seems mild (clear rhinorrhea, non-productive cough, no fever) and if the procedure does not require endotracheal intubation. On the other hand, the procedure should be postponed if the child is less than one-year-old or appears ill (fever, malaise), if clinical signs of bronchial hyperreactivity are present, if there are associated risk factors (asthma, passive exposure to tobacco...) or if tracheal intubation is foreseen (6).

b) The presence of a congenital malformation or disease

Congenital malformations are often associated. The presence of one malformation should thus lead to investigations to evaluate the presence or importance of the malformations that are usually associated to it : e.g., cardiac malformation in the presence of a labiopalatine cleft, urinary malformations in the presence of a hypospadias... This screening has usually been performed by the surgeon or pediatrician but the anesthesiologist must know the results of it.

If the child presents with a diagnosed congenital disease, it is always worth referring to a textbook like :

- *Anesthesia for genetic, metabolic & dysmorphic syndromes of childhood* by V. C. Baum & J. E. O'Flaherty (Lippincott, Williams & Wilkins, 1999)
- *NORD rare diseases* (2003)
- *Genetic Syndromes : recognition and perioperative aspects* by B. Bissonnette (McGraw Hill, 2004)

or to a website like :

- [orphanet.infobiogen.fr](http://orphanet.infobiogen.fr),
- [www.ncbi.nlm.nih.gov/Omim/](http://www.ncbi.nlm.nih.gov/Omim/),
- [www.icndata.com/health/pedbase/pedlynx.htm](http://www.icndata.com/health/pedbase/pedlynx.htm), or [www.rarediseases.org/](http://www.rarediseases.org/).

Moreover, it is not usual to find a website run by an association of parents whose child presents the disease. Although those sites rarely contain anesthesia-related information, the other informations provided are very useful to prepare the anesthesia plan.

c) The till now unnoticed cardiac murmur (2)

Even if the murmur seems to be functional, a specialized advice is worth being asked.

d) The adopted child

The child's familial and neonatal history is unknown. Clinical examination should therefore be very careful and the anesthesiologist should know the results of the health examination made by the pediatrician when the child arrived in our country (e.g., abnormal hemoglobin, hepatic serology, screening for tuberculosis, rare blood group etc...).

e) Obstructive sleep apnea (8, 9)

Obstructive sleep apnea (OSA) is characterized by episodes of partial or complete upper airway obstruction during sleep and is usually associated with hypoxemia and/or hypercarbia and their short- and longterm cardiovascular consequences. Postoperative respiratory complications are more frequent in children with OSA, especially if less than 2 years-old, if another medical condition (asthma, cardiac disease..) is associated or if preoperative nocturnal saturation nadir is  $\leq 80\%$ . A history of snoring, restless sleep, daytime somnolence and hyperactivity is very suggestive of OSA. Moreover, children are at increased risk for OSA if they present with :

- hypertrophied adenoids and/or tonsils
- midfacial hypoplasia (e.g., achondroplasia)
- macroglossia

- micrognathia (e.g., Pierre Robin sequence)
- hypotonia (e.g., Down's syndrome)
- following velopharyngoplasty (cleft palate).

However, 7-10% of children snore during sleep and a polysomnographic diagnosis of OSA is established in only 30-50% of them. There is currently no agreement on the need for preoperative polysomnography for the otherwise healthy child with a history suggestive of OSA but at least nocturnal saturation should be obtained in the other cases. All children with a history suggestive of OSA are at risk for upper airway obstruction during induction and awakening, and should be operated upon early in the list to allow more time for post-operative evaluation. Those with a diagnosis of OSA are not candidates for outpatient surgery because adenotonsillectomy does not immediately cure their sleep-disordered breathing..

#### f) Spina bifida

A child born with spina bifida is at risk of being or becoming allergic to latex : it should thus be operated upon in a latex-free setting . Moreover, hydrocephalus develops in 80% of the cases and CSF shunting is needed : the good functioning of the shunt should be confirmed before anesthesia. Last, most patients have an associated Type 2 Chiari malformation with its risk of coning (10).

#### g) Subclinical myopathy

The administration of halogenated agents even without succinylcholine can result in massive rhabdomyolysis and hyperkalemic cardiac arrest in children with Duchenne-like muscular dystrophy (Becker and some other rare myopathies) (11). Unfortunately, these myopathies present with few clinical signs in the infant and young child : the mean age at diagnosis is 5 years. Because Duchenne' myopathy occurs in 1/3500 boys and half of these cases are due to a new mutation (i.e. no familial history) the anesthesiologist should have a high index of suspicion and ask for a neurologic advice in the presence of muscle weakness, absence of walking at two years of age, presence of an abnormal gait or large calf muscles and if there is a familial history of muscle disease.

#### h) The mentally handicapped child

see text of Dr P. E. Pendeville in this issue.

## 2. *Psychological preparation of the child to this experience* (12)

Reducing preoperative anxiety decreases the incidence of postoperative negative behaviors

(nightmares, fear of separation, temper tantrums etc...) and facilitates perioperative care (13). It is therefore very important to take time to prepare the child and its parents to the experience of staying for one day or more in the hospital and being anesthetized . Moreover, the team made of the parents, nurses and doctors should try to make this experience as positive as possible to the child in order to prevent the development of longterm phobia about doctors and hospitals.

The first step is to try to allay anxiety in the parents because the child is very sensitive to its parents level of anxiety. To gain the parents's confidence, the anesthesiologist should not only answer openly to their questions but also pay much attention to the way he/she initiates contact and communicates with the child : the parents are reassured if the doctor looks "easy with children".

The child's preparation should be adapted to its developmental level : everything should be explained because fear of the unknown is a major source of anxiety. Many tools exist to help the parents preparing their child :

- books that can be read with them at home : such as « Je vais me faire opérer. Alors, on va t'endormir ! » by Sparadrap®, « Lucas en de slaapdokter » by S. Boonen and B. Vangehuchten or "Petit Pierre va en salle d'opération"
- a videotape or photoalbum of the OR at the clinic
- visiting the operating theatre
- a puppet show and/or explanations on a doll a with a childlife specialist
- or, for older children, an interactive cd-rom such as the one proposed by Abbott®.

The possible usefulness of parental presence during induction to decrease acute behavioral distress during induction and/or negative postoperative behavior is a controversial issue. Kain has shown that children premedicated with oral midazolam show less postoperative behavior problems during the first postoperative week than those who did not receive any premedication or were accompanied by a parent (14). However, when offered to accompany their child for induction of anesthesia, the vast majority of parents willingly accept. But all studies and questioning our patients' parents show that being present during its own child's induction of anesthesia is often a rewarding but terrifying experience : the parent should thus be prepared to what will happen, to what he/she will witness. We propose a hospital-made videotape to prepare the parents who want to accompany their child

Table 3  
Preoperative fasting instructions

<p>Minimum time interval between induction and :</p> <ul style="list-style-type: none"> <li>* clear fluids : 2 h</li> <li>* breast milk : 3-4 h ! most breastfed infants are not able to drink liquid from a bottle</li> <li>* formula milk : 4 h</li> <li>* cow-milk or solids : 6 h</li> </ul>
--

for induction of anesthesia (15). Whether a pre-medication is given or not should be individualized to the child's need for pharmacological anxiolysis and amnesia and knowing that it prolongs discharge time in case of day-stay surgery.

### 3. Perioperative instructions

#### 3.1. Preoperative fasting

The purpose of preoperative fasting should be explained to the parents and precise oral and written information should be given in order to avoid either cancellation of the procedure because the child is not fasted or an unnecessary long fasting time. The instructions should be repeated and adapted according to the foreseen time of induction during the phone call given the day before admission (see table 3). The parents should also be actively encouraged to give clear fluids to their child the day of surgery to avoid hypovolemia and hypoglycemia, and to reduce the risk of preoperative irritability of their child.

#### 3.2. Postoperative management

Ideally, a procedure-specific information sheet including the usual pre- and postoperative instructions should be given to the parents at the preoperative clinic. They should be encouraged to read it before the day of admission in order to be able to ask questions if needed and to prepare adequately their child's postoperative care.

Postoperative pain management should be carefully explained to the parents bearing in mind that caring for a sick or painful child is not their usual job, and that subjectivity and emotion can make this management very difficult. Moreover, parents often tend to give less pain medication than advised due to misleading perception about analgesics and their risks and to difficulties evaluating their child's pain (16). In order to facilitate the parents' task and to ensure good analgesia to the child, we propose an analgesic scheme combining two painkillers :

- one to be administered around-the-clock to prevent pain : e.g., paracetamol
- another to be administered as a rescue if pain is present between two doses of the first one : e.g., ibuprofen.

Parents should also receive practical information regarding wound care, reorientation of the child and how to contact the hospital in case of problem. They should also be told that a phone call will be given home the day after surgery to help solve any problem.

### 4. Quality improvement

Although this aspect is beyond the scope of this topic, the smooth functioning of all the preparation process is critically dependent on the teamwork of nurses, secretaries and doctors of different specialties. Moreover, the availability of electronic files is mandatory to enable the anesthesiologist to have quick access to the child's previous data.

Last, a systematic phone call should be given to the parents the day following surgery to check the child's clinical condition, to make sure that the postoperative instructions are understood and followed, and to reassure the parents. This interview is also a good opportunity, using a prepared questionnaire, to evaluate the parents's satisfaction with the process and specially :

- the appropriateness of the information provided preoperatively or the day of admission
- the reasons for dissatisfaction : long pre- or postoperative waiting time, any delay, pain...

The collected information should be the base of an ongoing quality improvement process.

### CONCLUSION

When preparing and organizing a child's short stay in the hospital, the health team should keep in mind that the burden of pre- and postoperative care is transferred to the parents : to make this a successful and rewarding experience for the family, all those involved should show professionalism, teaching skills and flexibility.

### References

1. Kelly M. M., Adkins L., *Ingredients of a successful pediatric preoperative care process*, AORN JOURNAL, **77**, 1008-12, 2003.
2. Wodey E., Gai V., Ecoffey C., *La consultation d'anesthésie*

- pédiatrique*. In : SFAR, ed. *Conférences d'actualisations 1998 de la SFAR*. Paris, Elsevier, 9-20, 1998.
3. Skolnick E. T., Vomvolakis M. A., Buck K. A., *et al.*, *Exposure to environmental tobacco smoke and the risk of adverse respiratory events in children receiving general anesthesia*, ANESTHESIOLOGY, **88**, 1144-53, 1998.
  4. Favier R., Nguyen P., de Moerloose P., *Pour ou contre un bilan d'hémostase préopératoire chez un enfant sain ? (editorial)*, ARCH. PEDIATR., **1**, 11-3, 1994.
  5. Odegard K. C., McGowan F. X., DiNardo J. A., *et al.*, *Coagulation abnormalities in patients with single ventricle physiology precede the Fontan procedure*, J. THORAC. CARDIOVASC. SURG., **123**, 459-65, 2002.
  6. Parnis S. J., Barker D. S., Van Der Walt J. H., *Clinical predictors of anaesthetic complications in children with respiratory tract infections*, PAEDIATR. ANAESTH., **11**, 29-40, 2001.
  7. Huettemann E., Junker T., Chatzinikolaou K. P., *et al.*, *The influence of anthracycline therapy on cardiac function during anesthesia*, ANESTH. ANALG., **98**, 941-7, 2004.
  8. Brown K. A., *What we do 'nt know about childhood obstructive sleep apnea*, PAEDIATR. ANAESTH., **11**, 385-9, 2001.
  9. Wilson K., Lakheeram I., Morielli A., *et al.*, *Can assesment for obstructive sleep apnea predict postadenotonsillectomy respiratory complications ?*, ANESTHESIOLOGY, **96**, 313-22, 2002.
  10. Radhakrishna S., *Coning in a patient with spina bifida following general anaesthesia for cystoscopy (letter)*, ANAESTHESIA, **55**, 295-6, 2000.
  11. Larasch M. G., Rosenberg H., Gronert G. A., *et al.*, *Hyperkalemic cardiac arrest during anesthesia in infants and children with occult myopathies*, CLIN. PEDIATR., **36**, 9-16, 1997.
  12. McGraw T., *Preparing children for the operating room, psychological issues*, CAN. J. ANAESTH., **41**, 1094-103, 1994.
  13. Kain Z. N., Mayes L. C., O'Connor T. Z., *et al.*, *Preoperative anxiety in children, predictors and outcome*, ARCH. PEDIATR. ADOLESC. MED., **150**, 1238-45, 1996.
  14. Kain Z. N., Mayes L. C., Wang S. M., *et al.*, *Postoperative behavioral outcomes in children, effects of a sedative pre-medication*, ANESTHESIOLOGY, **90**, 758-65, 1999.
  15. Cassady J. F., Wysocki T. T., Miller K. M., *et al.*, *Use of a preanesthetic video for facilitation of parental education and anxiolysis before pediatric ambulatory surgery*, ANESTH. ANALG., **88**, 246-50, 1999.
  16. Kankkunen P., Vehviläinen-Julkunen K., Petilä A. M., *et al.*, *Parents's perceptions and use of analgesics at home after children's dayy surgery*, PAEDIATR. ANAESTH., **13**, 132-40, 2003.