Pediatric anesthesia—
Guidelines for the nurse anesthetist

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This article provides the reader with an over-all view of pediatric anesthesia. Special emphasis is placed upon the considerations necessary when working with infants and children. Much of the information provided is elementary and serves as a basic refresher, encompassing physiology, techniques, and anesthetic drugs.

Pediatric anesthesia has developed concurrently with pediatric surgery. Improved surgical techniques plus the introduction of antibiotics as well as greater knowledge of fluid and electrolyte therapy and improved anesthetic drugs and techniques, have recognized that the child is not just a small adult.

Among the first to contribute to the development of modern pediatric anesthesia were Digby Leigh and Kathleen Belton of Canada. Their textbook, Pediatric Anesthesia, first published in 1948, is still a classic reference. Today, the names of Robert W. Smith and C. R. Stephen stand out in the field. Because of these men and women, anesthetists have a better understanding of the responses of children to anesthesia along with an availability of specially designed apparatus and methods.

Anatomy and physiology
The most obvious difference between child and adult is size. The proportion of the body's structures and surface area are two of the most significant measurements. The infant's head is large and bulky, his neck short,
chest small, and the abdomen is weak. In Table I, we see that the smaller the patient, the greater is the relative surface area. This is best interpreted when the curve of surface area (as related to body weight) is compared to the curve of basic metabolic activity.

**Respiratory system**

The special features of the respiratory system in the infant and child make it particularly vulnerable. The nose is small and short; the nasal mucosa is delicate and vascular. Even slight swelling may cause obstruction and respiratory distress, especially in infants, who are not used to mouth breathing.

Abundant secretion is also a characteristic of infants and children. Young children are unable to remove secretions from the nose by their own effort.

A large tongue is ideal for sucking but may cause respiratory obstruction in the relaxed infant. Hypertrophied tonsils and adenoid tissue also may be found in infants and children.

The larynx of the newborn is more cephalad (that is, located higher in the neck) than the adult. At birth, it is located opposite the fourth cervical vertebra. The larynx is funnel-shaped, and it is narrowest at the level of the cricoid cartilage. The epiglottis is narrow and U-shaped, its edges slightly rolled.

With growth, the larynx slowly descends and the epiglottis assumes a more vertical position which makes the entrance to the larynx more in line with the trachea.

The thoracic cage is small, and the sternum is soft. The ribs of the infant lie horizontally, reducing expansion. The main respiratory muscle is the diaphragm. This is restricted somewhat by a large liver and stomach. Intercostal muscles are poorly developed and give little assistance.

Recent studies show the bifurcation of the bronchi from the trachea to be similar to that of adults, that is, the right main bronchus branching at 25 degrees, the left at 70 degrees.

The bronchi and bronchioles in infants and small children are plugged easily even by small amounts of secretions or swelling. Another important aspect is the relationship of anatomical dead space to body weight. There is approximately 1 ml of anatomical dead space per lb of body weight in normal infants and children.

Basal oxygen requirements at birth are estimated to be 6 ml per kg per min as compared to the adult figure of 4 ml per kg per min. This oxygen requirement can, and does, fluctuate with many factors. Fever, for example, will raise the oxygen requirement 7% per degree of temperature elevation. Illness, emotion, and muscular activity further increase the oxygen requirements.

In 1937, Dr. A. E. Guedel published a metabolic curve, showing the child's metabolism (hence nutritional and oxygen needs) to be minimum at birth and maximum at six years of age with a second peak at twelve. More recent studies by Lewis, Lee, and Iliff at the University of Colorado, have shown a curve which peaks at between six and eighteen months of age with a plateau effect in place of a prepuberal peak. In general, however, it may be assumed that infants and children will require larger amounts of oxygen because of an elevated metabolic rate.

**The nervous system**

At birth, the bones of the skull are not fused. They become more stable by six months of age and finally fuse by four years of age.

The spinal cord extends to the third lumbar vertebra in the newborn, assuming it's permanent position at the
first lumbar vertebra by the time the child is one year old.

The infant’s nervous system is both variable and lacking in control. Sensory tracts are myelinated at birth, but motor tracks are incompletely myelinated. This is most evident when observing the infant’s muscular activity.

Newborn infants have been shown to exhibit no response to pain for up to one week of life. Mass responses (being unable to localize or identify the source) are elicited for up to one month of age. Responses become more specific as cortical development continues.

It is well known that children are susceptible to convulsions. This may result from the infant’s characteristic lack of myelin, greater water content of brain tissue, a higher metabolic rate, as well as an immature inhibitory response pattern.

The vagus nerve is active in the newborn. Bradycardia is seen with hypoxia, yet there is no evidence of laryngeal spasm with an awake intubation. This is another example of the infant’s variability.

The temperature-regulating center in the hypothalamus is active but not well developed in infants. This explains why infants are considered poikilothermic. Body temperature is elevated by increased heat production or increased heat retention. Loss of body heat is via radiation, conduction, or convection. Body heat is lost because of decreased heat production, vasodilatation, or a cold environment.

Premedications and anesthetic drugs affect the infant’s temperature in many of these ways.

Belladonna drugs increase the metabolic rate and decrease heat loss by decreasing sweat production. General anesthesia usually causes peripheral vasodilatation and depression of the central temperature control center. Anesthetic techniques, such as the “to and fro absorption system” also cause a rise in body temperature.

All factors considered, it is essential to monitor the temperature of every pediatric patient undergoing anesthesia.

Excretory and endocrine systems

The kidney is grossly complete, yet function of the glomeruli is not complete until the child is several months old.

The adrenal glands are greatly enlarged at birth, undergoing involution as the infant grows older.

The thymus gland is also large but decreases with age. The theory of respiratory obstruction from an enlarged thymus has lately fallen into disrepute.

The newborn’s response to stress depends upon the steroids endowed him by his mother. Norepinephrine is the principle catecholamine produced by the adrenal medulla up until the child is several months old.

The cardiovascular system

At birth, the switch from fetal to adult circulation usually occurs without shunting or cardiovascular collapse. Major cardiovascular anomalies may be incompatible with life, but others are often corrected soon after birth. The myocardium is strong, and the heart rate may vary without significant consequences. From a resting rate of between 90-110, the heart rate may rise to between 170-180 beats per minute when the infant cries. The average heart rate declines as the child grows older.

Blood volume in the newborn averages 84 ml per kg of body weight as compared to the adult figure of 65 ml per kg of body weight. Red cell count and hemoglobin vary during infancy—elevated at birth, falling until the infant is three months old, and then rising to
adult levels by eight or ten years of age. The child’s blood pressure is slightly less than that of the adult. At birth, the systolic level ranges between 75-85 mmHg and usually rises within two weeks.

**Fluid and electrolyte balance**

Fluid volume must be considered in two general divisions: intracellular and extracellular. In adults, the extracellular fluid comprises one-third of the total fluid volume. In infants and children, extracellular fluid consists of one-half of the total volume.

Infants and children also have more fluid in comparison to body weight than adults. At birth, 70-83% of body weight is fluid. Adults average 65% of body weight as fluid.

For two to three months after birth, the renal function of the infant is not mature. Wastes are flushed out with relatively large quantities of water. Urine tends to be hypotonic and dilute. The ability to excrete ions, especially sodium and chloride is lessened. Studies of the infant’s blood chemistry show an increased plasma chloride level and a decreased bicarbonate level; hence a lower plasma pH. With immature buffering mechanisms, slight additions of acid or base result in exaggerated swings towards acidosis or alkalosis.

It is not possible to translate fluid therapy directly from adult to child. Fluid requirements, on the whole, are similar to those of oxygen—being minimal at birth, rapidly increasing to a maximum between 9 and 18 months of age, then gradually lowering throughout childhood and adult life. Correct therapy, therefore, must encompass the relatively higher requirements of the infant and child.

A good method to use is the surface area of the body as a guide, since surface area is related to metabolism. In Table II, the normal daily fluid requirements for infants and children are listed. Any preexisting deficit should be recognized (as well as operative loss) and these amounts should be added to the daily requirement. If fever is present, fluids should be increased 8-10%.

### Table II

**Daily fluid requirements in infants and children (cc’s)**

<table>
<thead>
<tr>
<th>Body Weight</th>
<th>Approximate Surface Area (M²)</th>
<th>Maintenance Requirements</th>
<th>Replacement for Moderate-Severe Dehydration</th>
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<tr>
<td>lbs</td>
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<td>4</td>
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Blood volume usually represents 7-8% of the child’s weight. Accurate records of loss and replacement are usually the responsibility of the anesthesiologist. Clinical signs of blood loss include the blood pressure, pulse volume, color of the skin and mucus membranes, volume of heart sounds, central venous pressure, and urinary output. Blood loss must be suspected if a child, who has been maintained on a fixed concentration of an anesthetic, suddenly appears more deeply anesthetized. Any blood loss over 30 cc’s should be replaced since 1 ml of loss in a child equals 10 ml in an adult.

The anesthesiologist must have an accurate method of measuring the fluid to be infused. One simple and accurate method is to attach a 20-cc syringe with a three-way stopcock in the infusion line. Among pediatric specialists, the feeling is that all fluids administered to infants and children should be warmed, if no contraindications exist. Blood, of course, must be warmed; and there are several types of water baths for this purpose.

Sites for infusion include the umbilical vein in the newborn, scalp veins in infants, or the dorsum of the hand in older children. The antecubital space is not recommended unless venipuncture can be performed easily; arterial and median nerve damage can otherwise result. Often venipuncture is performed after induction when vasodilatation may be present, and the child feels no pain.

Equipment for pediatric infusions includes an array of products. Site of infusion and purpose should direct the anesthesiologist, as well as his skill in using certain products.

**Psychological factors**

Robert Smith points out, that, “Next to anatomical differences, the emotional pattern of the child is most striking in contrast to the adult”.

Hospitalization means separation from home, family, and friends. Unfamiliar surroundings and personnel, plus the child’s illness, produce stress that is manifested in a variety of symptoms.

The ideal approach is to prepare the child at home. Honest, simple explanations by parents help promote less anxiety. This ideal, as one knows, may not be the actual situation. Parents may not be able to convey a reassuring attitude because of their own fears or memories of unpleasant hospital experiences.

With or without this home preparation, the child must be admitted far enough in advance so that the necessary tests and examinations can be completed. The trend for out-patient surgery is particularly suited for the child because of the minimal separation from the home.

Every effort should be made by the anesthesiologist to visit the child preoperatively. With such a visit, the anesthesiologist is able to evaluate the child physically and is able to establish a rapport free from the additional stress of an operating room environment. The plan for anesthesia should be explained to the child in a plain, straightforward, truthful manner, in a language he can understand. It has been shown that the child’s degree of apprehension is the same, whether he is facing a tooth extraction or open-heart surgery. Pre-medication for infants and children is controversial and will be discussed in a separate section.

Once in the operating room, the anesthesiologist should continue the child’s psychological preparation. This is helped by the anesthesiologist-child rapport established preoperatively.

The child should be able to have some sense of control in the situation.
If the child is allowed to hold the face mask, he is just one step removed from the anesthetist. Here, participation must be distinguished from decision-making. The operating room is not the place for a child to make decisions; this only adds to the stress he is experiencing.

Yet, another way in which to allow the child a sense of mastery of the situation is to allow “security blankets”. Recommendations to ensure a constructive pre-anesthetic psychological state have been made by Bothe and Galdstron. They are:

1. Discover how the child views his hospitalization.
2. Establish a rapport with the child using his own approach, correcting information as necessary.
3. Allow “security blankets”.
4. Permit the child a sense of mastery or control.

**Preoperative medication**

The main purposes for using pre-opreative medications are to:

1. Decrease vagal activity.
2. Limit secretions.
3. Produce calmness without cardio-respiratory depression.

There is no single drug which combines all these attributes. So much depends upon the child, the type of operation, and the anesthetic agent to be employed. In fact, skill and kindness are just as important as preoperative medication when dealing with small children.

Here is a listing of some of the advantages and disadvantages of the major preoperative drugs.

*Belladonna drugs* decrease airway secretions and protect against bradycardia due to vagal stimulation. Belladonna drugs increase the metabolic rate and help increase body temperature by conserving body fluids. In excessive doses, some cause excitement and the slight discomfort of a dry mouth.

*Barbiturates* sedate if pain is not present. For induction, they may decrease the amount of anesthesia required. They offer a preventive approach in reducing the danger of convulsions, and they also may decrease the incidence of nausea and vomiting. Barbiturates in any dosage decrease respirations, sometimes to an undesirable level; and in a few cases, if used alone in the presence of pain, cause excitement.

*Narcotics* reduce pain awareness, hence creating a feeling of well being. Narcotics depress respirations and usually increase the incidence of post-operative nausea and vomiting.

*Neuroleptic agents* appear to offer sedation without cortical depression, in addition to reducing metabolic oxygen demand. Respiratory depression seems to be the greatest drawback with the use of these agents; but post-operative hallucinations, especially in older children, have been reported.

Wylie and Churchill-Davidson point out another factor to be considered when discussing preoperative medication. They point out that the induction of anesthesia in children presents the greatest problem between the ages of 18 months and 5 years. These children are almost always impossible to control by any verbal approach. For safety and sedation, the use of a preoperative medication is indicated. It can be given orally, rectally, or parenterally; and the actual anesthesia is best induced with an inhalation technique.

In children over five years of age, Wylie and Churchill-Davidson recommend a combination of barbiturates, or narcotics and belladonna drugs preoperatively. This, they say, will produce a calm, drowsy, cooperative child with a dry respiratory tract. These children can then be induced via the intra-
venous technique. Venipuncture may be facilitated by the narcotic-induced vasodilation and by the use of fine, sharp needles.

**Techniques of pediatric anesthesia**

Because anesthesia is an art as well as a science, individual factors play an important role when choosing the technique to use for a particular patient. Smith outlines some of these individual factors as follows:

1. The age of the child.
2. Operative considerations, that is, procedure, position, and use of cautery.
3. Disease and general condition of the child.
4. Experience of the anesthetist.
5. Preference of the surgeon.
7. Local factors, such as air conditioning, conductive equipment, and financial considerations.¹

**Inhalation techniques.** In the open-drop technique, a volatile liquid, such as ether, is dropped on a gauze mask held over the patient's face. The main advantage to this technique is that equipment is kept simple; and if diethyl ether is used, it has the additional advantage of having a wide safety margin. The anesthetist must keep a steady, slow rate of administration and must not soak the mask. The patient's eyes are covered, and the anesthetist raises the mask at intervals to examine the face for signs of irritation or pressure marks.

Definite disadvantages to the open-drop method include:

1. The anesthetist is exposed to the anesthetic agent.
2. The effort required to breathe through the mask may be tiring for the patient.
3. There is no way to assist respirations; thus, only anesthetics which stimulate respiration should be given by this method.

Non-rebreathing inhalation techniques. These techniques, which overcome dead space by washing out all expired gases, are intended primarily for children. There are various methods and equipment involved, notably the Ayre's T-Tube System and its modifications.

Non-rebreathing techniques provide minimal resistance to respiration and adequate carbon dioxide elimination. In addition, these techniques are probably the most efficient for use with endotracheal anesthesia in infants and children.

The method's chief disadvantages are higher flow requirements, increased expense, and explosive hazards with the employment of certain agents. High gas flows also wash out large amounts of body heat and moisture.

**The Ayre's T-Tube System.** Dr. Ayre originally devised this technique for cleft lip and cleft palate operations. Because of its simplicity, however, this equipment has become a standard in all types of pediatric surgery.

The apparatus consists of a T-tube inserted in the gas flow line close to the face piece adapter. On inhalation, the child draws in gases from the anesthetic feed line and some air from the open arm of the T-tube. On exhalation, the gases pass out the open arm of the T-tube.

In 1965, Ayre established approximate gas flow rates for this system. At least twice the minute volume of the child should be delivered to the anesthetic feed line. This can be calculated by multiplying dead space (one milliliter per pound of body weight) by three so as to equal tidal air. Rate times tidal air equals minute volume.

Jackson Rees modified this equipment somewhat in order to control or assist respirations. An open-ended bag is attached to the expiratory limb of
the T-tube. The distal end of the breathing bag may be partially closed by a stopcock.

Rebreathing Inhalation Techniques: The "to-and-fro" and "circle" systems. In the to-and-fro system, the patient breathes back and forth into a cannister containing a carbon dioxide absorbent and continues into a bag reservoir. In using this technique, the soda lime cannister must be large enough so that the exhaled air remains in contact with the absorbent long enough for the chemical reaction to take place. Hence, the size of the cannister should accommodate a little more than the child's tidal volume.

In the to-and-fro system, there are no valves to create resistance, the explosive hazard is reduced, and the gas flows are low. Because the system preserves heat and moisture, the child is pink and warm throughout the anesthetic.

The main disadvantage to this technique is that the equipment is cumbersome and care must be taken so as not to cause burns should a hot cannister be positioned near the skin. Because of the retention of body heat (and subsequent rise in body temperature), this technique is contraindicated in children who are febrile.

Under the circle system, when the patient inhales, gases pass from a supply valve or flowmeter through an inhalation valve and delivery tube to a mask or endotracheal tube into the lungs. On exhalation, the gases pass through an exhalation tube and valve into a reservoir. In this area, the carbon dioxide absorbent and fresh gases are added.

Resistance to breathing is slightly greater than with the to-and-fro system, since inhalation and exhalation valves are present in the circuit. Resistance is increased further when these valves become moistened by water vapor from exhaled air.

As compared to the to-and-fro system, the circle system has a constant amount of dead space, and there is little danger of blowing soda lime dust into the child's lungs. In addition, the absorber is far enough away to prevent a rise in the child's body temperature, and there is no drag on the mask or endotracheal tube.

Endotracheal intubation. As soon as direct endotracheal intubation became an accepted procedure for adults, it was naturally adapted for pediatric use. Today, many surgical procedures would be impossible both in children and adults if it were not for the use of endotracheal intubation. Yet, controversy still surrounds this technique.

Some of the advantages to endotracheal intubation include:

1. Assurance of the patient's airway.
2. Prevention of aspiration of vomitus or blood and tissue from the mouth and pharynx.
3. Ventilatory assurance in the prone position.
4. Reduction in the amount of dead space in the anesthetic system.

Disadvantages are usually discussed in terms of the complications resulting from intubation such as spasm, apnea, loosened or dislodged teeth, and lacerations of the soft tissue. But the main disadvantage is the introduction of all the additional equipment that intubation entails. Laryngoscopes, inflatable cuffs, and connectors all can add a new group of risks.

Some of the indications for endotracheal intubation are:

1. An operation on a patient with a full stomach or intestinal obstruction.
2. Intrathoracic procedures.
3. Operations in the prone position.
4. Intracranial procedures.

Indications for intubation may seem more important than the contraindications. However, if the anesthetist believes he should intubate all children, he may subject his patients to unnecessary trauma.

**Basal anesthesia with rectal agents.** Rectal administration of thiobarbiturates including Pentothal®, Surital®, methohexital (Brevital®) or tribromoethanol (Avertin®) has the advantage of involving neither mask nor needle. Most children under five or six years old have no objection to the passage of a rectal tube; and after the solution is given, fall fast asleep, considerably reducing psychic trauma.

Some disadvantages that have made this technique less popular in recent years include:

1. Absorption rates may vary so much that there is little control over effect.

2. The technique is time consuming and requires careful preoperative attention by the anesthetist.

3. In the young infant, despite careful instillation, it may act as an enema.

**Local and regional techniques.** Because local and regional anesthetic techniques demand so much cooperation from the patient, the anesthetist may discard this approach. These techniques, however, do serve a valuable purpose and may actually be the anesthetic of choice when the anesthetist is confronted with lacerations and fractures in children with full stomachs or in the premature infant.

The most popular modern agents are tetracaine (Pontocaine®) and lidocaine (Xylocaine®). Local infiltration is the major method of administration on an outpatient-basis.

With severe lacerations or fractures, a regional block may be indicated. They are especially useful in emergency procedures where there may be danger of aspiration or an upper respiratory infection. In a brachial plexus block, the technique is similar to that used in the adult. In small children who may resist, the anesthetist may employ a dissociative agent such as ketamine and then infiltrate by anatomical positioning.

When the child is one year of age, the spinal cord has assumed its permanent position, ending at the first lumbar vertebra. The child is usually more flexible and the lumbar puncture is more easily performed. Children will often accept spinal anesthesia with cooperation. Others may be apprehensive or resistant. For this reason, the anesthetist should have other methods available.

**Significant features of anesthetic agents and relaxants commonly used in pediatric anesthesia**

*Diethyl ether* is especially easy to administer and control. The patient's vital signs remain acceptable and there are reliable signs of anesthetic depth. In addition, there is minimal respiratory depression with bronchodilatation. Finally, diethyl ether provides good relaxation. However, diethyl ether is irritating to the airway, and it acts as an emetic and is explosive. Its use should be restricted in patients with diabetes or premature infants.

*Nitrous oxide* is a pleasant, non-explosive agent. It provides analgesia, is non-emetic, and has no effect on metabolism. Its use is indicated for procedures that require no relaxation, for induction, or as a supplement for thiopental — relaxant anesthesia. Nitrous oxide is a weak agent when used alone, its anesthetic level is difficult to control and requires low oxygen concentrations.

*Halothane* is also a pleasant, non-irritating agent which does not increase
secretion production. It is rapid acting, non-emetic, and non-explosive. Halothane is a myocardial depressant. It provides poor relaxation and poor analgesia, sensitizing the myocardium to catecholamines. Repeated use of halothane may cause the origins of hepatotoxicity.

Methoxyflurane has a great margin of safety, provides good relaxation and analgesia, and is non-explosive. Methoxyflurane has a prolonged induction and recovery time, is a respiratory and myocardial depressant, and has been suspected as a cause in hepatotoxicity.

Cyclopropane is a pleasant agent with a rapid induction and recovery period. It provides adequate relaxation, is easily controllable, and does not stimulate secretion production. It is indicated for use primarily in poor risk patients, prematurity, and in patients with cardiac disease for ease of induction and maintenance. Cyclopropane is explosive, it sensitizes the myocardium to catecholamines, it is a bronchoconstrictor, and contraindicated in patients with pheochromocytoma or toxic thyroid.

Intravenous Barbiturates provide pleasant inductions if the needle is already in place. They are suitable for maintenance in older children, if supplemented. There is no explosive hazard, and they are generally non-emetic. Intravenous barbiturates depress respiration and do not give analgesia or relaxation. Their use increases the danger of laryngospasm. Venipuncture is undesirable to most children. The total dosage of barbiturates should be limited. They are especially contraindicated in pediatric patients with full stomachs.

Neuroleptic agents provide excellent analgesia and retain normal pharyngeal-laryngeal reflexes. They offer both cardiac and respiratory stability and are non-emetic. Neuroleptic agents are cumulative, synergistic with other depressants, parasympathomimetic, and are difficult to control. Respiratory arrest may occur and hallucinations may occur post-operatively in older children.

Relaxants offer rapid, complete relaxation. They are indicated for the release of vocal cord spasm, as well as muscular relaxation for abdominal procedures and for facilitating endotracheal intubation. Relaxants also are used to cease convulsive muscular action. Relaxants, however, cause respiratory depression, immediately, as well as for a prolonged period. Since they relax the cardiac sphincter of the esophagus, they must be used with care in patients with a full stomach. Relaxants tend to elicit different responses in various children.

Equipment
The anesthetic techniques previously described entail the use of special equipment. Some has been described, others just mentioned. New kinds of equipment or modifications of existing equipment are constantly appearing on the market.

Naturally, all anesthetic equipment must be safe and fully tested before put into use, and it is up to the anesthetist to use the equipment skillfully.

Inhalation anesthesia equipment used in pediatric anesthesia should fulfill the following special requirements:
1. The mechanical dead space must be as small as possible.
2. The respiratory resistance must be minimal.
3. Carbon dioxide must be efficiently eliminated.
4. The size of the unit should permit a practical attachment of the apparatus to the patient.
5. The equipment should allow or
enable the anesthetist to assist or control respiration.\textsuperscript{1}

Monitoring equipment is essential and should be as safe and uncomplicated as possible. A variety of sizes and designs are available for stethoscopes, blood pressure equipment, thermometers and water mattresses to control body temperature. The same is true for ventilators, assisters and resuscitators.

Accessory equipment must be scaled for the pediatric patient. Operating room tables, ether screens, and arm boards designed for the smaller patient make it easier for the whole operating team to work.

Toys, books, and games also serve a purpose in pediatric anesthesia.

Special considerations

The physical status of infants and children varies considerably. Their reaction to disease is so individual that the anesthetist must evaluate his patient carefully. The child’s reaction to anesthesia is also individual, and the patient’s course must continually be reevaluated. Safety, skill, and simplicity are the key elements in pediatric anesthesia.

No attempt has been made to outline one specific technique to use in working with children because of this individuality. But, as outlined by Campbell and Cleverdon\textsuperscript{7}, there are some do’s and don’ts in pediatric anesthesia.

Do:

“Through diligent study, gain a good knowledge of anatomy and physiology.

Visit your patient prior to anesthesia, observe his physical condition, and if he is old enough, talk to him so that he will feel confident.

Be sure that proper sizes of airways, endotracheal tubes, laryngoscopes, masks and breathing bags are selected.

Don’t:

“Begin an anesthetic without oxygen, a means of artificial ventilation, and suction equipment readily available.

Improvise intricate techniques. It is best to keep techniques as simple as possible.

Use just any size breathing bags, tubes, or soda lime cannister.”

REFERENCES


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