

“Inhalational or Intravenous Induction of Anesthesia in Children? An Audit of Patient and Parent Preference”

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Summary

Background: Taking heed of patient preferences is central to the concept of “patient-centered anesthetic practice”. Anesthesia in children is usually induced by the inhaled or intravenous routes. We hypothesized that children may have preferences for their route of induction of anesthesia, and for preoperative sedation. Accordingly, we audited the preferences and compliance of children for inhalational or intravenous induction of anesthesia and for premedication.

Methods: With institutional approval and guardian consent, one hundred and seventeen children and their guardians were visited pre-operatively. The opinions of the child (primarily) and guardian (secondarily) were canvassed, in standard fashion, regarding choice of route for anaesthetic induction and request for premedication.

Results: Eight children <2 years of age were unable to communicate, all children >5 years and older were able to communicate, as were 1 of 6 two year olds, 1 of 6 three year olds and 5 of 6 four year olds. Parental recommendations occurred in 14(12%) of children. Fifty eight (50%) children had histories of previous anesthesia, induced by needle in 23 (20%), mask in 32(57%) and by undetermined route in 14 (24%). Intravenous and inhaled inductions were chosen by 23(20%) and 62 (53%) of children ($p<0.0005$), with 10(9%) and 22(19%) children either expressing no preference or being unable to choose. Of 23 children initially selecting injection, 10(44%) subsequently changed their choice to inhalation, and of those initially selecting inhalation one patient subsequently chose injection. In actuality, 14(12%) and 103(88%) children were induced by needle and mask, respectively ($p<0.0005$). Premedication was requested by 64(55%) children.

Conclusion: These data suggest that children as young as two years of age may have an opinion and that children >5 years can be expected to have an opinion regarding their route for induction of anaesthesia, and that approximately 50% of children accept an offer of premedication.

Keywords: Anaesthesia; Paediatric; Induction; Inhalation; Intravenous; Patient preference

Introduction

A fundamental facet of the pre-operative visit in pediatric anesthesia is the establishment of trust and confidence between the anesthesiologist, the child and the child's parent or guardian in order to facilitate decision making regarding the child's anesthetic care. During this visit, consideration is given to the need for premedication, parent-child separation, route for induction of anesthesia and aspects of post-operative care. Accordingly, it has long been the practice of the authors to discuss the nuances of inhalational versus intravenous induction of anesthesia with the child (and their guardian) in an attempt to solicit the child's preference of route for induction of anesthesia in order to promote the child's cooperation during induction of anesthesia.

Notwithstanding these considerations, however, it is the opinion of some pediatric anesthetists that a discussion regarding intravenous (IV, needle) versus inhalational (mask) induction is inappropriate in children [1]. Accordingly, a prospective audit [2] was undertaken on children presenting to the authors to examine, primarily, the preferences of children for intravenous versus inhaled induction of anesthesia (and the demography and outcomes associated with such choice) and, secondarily, both the incidence of request for premedication by pediatric patients and the incidence of parental input with respect to these choices.

Methods

The study was approved by the Committee for the Protection of

Human Subjects of the University of Texas Medical School in Houston, which authorized the collection of data on children presenting to the authors for ambulatory surgery under general anaesthesia with verbal, not written, consent from parent, guardian or child, and provided that patient confidentiality was maintained. Data was prospectively gathered on 117 consecutive ASA Grade 1 and 2 children presenting to the authors for ambulatory surgery under general anesthesia.

Shortly after their arrival to the Day Surgery Unit (DSU), each child and their accompanying guardian or parent was visited by one of the authors, who introduced himself to the child and parent. As is customary in pediatric anesthesia, the ensuing interview focused on the child, was inclusive of the accompanying adult and conducted in a gentle, non-threatening and encouraging manner. During history

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taking, examination, explanation and re-assurance, it was attempted to establish a mutuality of confidence and communicability between anesthesiologist, child and adult (parent).

At the end of the interview, the preference of each child for 'needle' or 'mask' induction of anesthesia was canvassed by reciting the following standardized verbal statement-questionnaire (with appropriate amplification when, and if, sought by the child or guardian) to the child: "When you come to the operating room/room where we are going to fix your (problem stated simply), we want to give you the choice between two 'ways' of going to sleep, both of which work just well. The first 'way' is for the nurses here to put some white cream on the back of your hand which will take a little while to make the skin numb; then, when you arrive in the room where we will send you off to sleep while we fix your (problem), I will take the cream off your hand and give you a tiny injection through the numb area with a small needle which will send you off to sleep. The second 'way' is, when you are in the room where are going to fix your (problem) and need you to go to sleep, for me to gently hold a plastic mask, like air- plane pilots wear and which smells of strawberries, over your nose and mouth; if you take five to ten big breaths through your mouth, 'breathing like a fish', you will quickly go off to sleep. Both ways work just fine. Whichever you choose, I will be with you to look after you while you are sleeping and, when we have fixed your (problem), mum/dad/guardian and I will be with you when you wake up."

Thereafter, the opinion of the child regarding premedication was canvassed by reciting to the child a second standardized simple questionnaire-statement, again with additional explanation using lay terminology for anxiety and medication whenever necessary: "Would you like some medicine to make you calm and sleepy before you come to the room where we are going to fix your (problem), or do you feel alright in yourself as you are? If you would like this medicine, would you like to take the medicine in a small drink, or would you prefer a tiny injection?" Midazolam 0.5mg/kg per os was administered immediately or timeously to those choosing premedication and to those in whom the guardian or anesthesiologist deemed premedication appropriate. At the scheduled time for surgery, each child was transported from the DSU to the operating suite either on a hospital trolley or carried by the accompanying adult, anesthesiologist or nurse. Separation of the child from the patient occurred either at the entrance to the operating suite, whereupon the anaesthetist or nurse carried the child into the operating room or in the operating room after induction of anaesthesia. In the operating room, following application of non-invasive monitoring devices (ECG, SaO2, and BP) to cooperative children, induction of anesthesia was commenced in the manner selected by the child. With non-cooperative children, monitoring devices were applied immediately after induction of anesthesia.

Demographic data (age, weight, height, gender, and ethnicity and ASA status), patient preference regarding route for induction of anesthesia and premedication and parental interjections or recommendations were recorded on customized data sheets. The Fischers Exact and the Chi-squared tests were used for analysis, with $p < 0.05$ regarded as significant.

Results

Data on 117 (66 males, 51 females) consecutive children of African American (3 male, 7female), Asian (1 male, 2 female), Hispanic (21

males, 10 females), Caucasian (41 males, 29 females) and Oriental (3 females) ethnicity aged between 7 months and 16 years was collected. No gender differences regarding history of anesthesia, previous route of anesthesia, choice of and eventual route of induction were demonstrated. Fifty eight (50%) children had undergone anesthesia previously, which had been induced by injection in 12(21%), inhalation in 32(57%) and by unknown route in 14 (24%) children ($p < 0.0005$, IV v, inhalational; $p < 0.005$ inhalational v. unknown route) (Table 1).

Intravenous and inhalational inductions were chosen by 23 (20%) and 62 (53%) children ($p < 0.0005$), respectively, with 10 (9%) children not minding which route was used and 22 (19%) being unable to choose. In the operating room, of the 23 children who had selected intravenous induction, 10(44%) children changed their mind and requested inhalational induction and one child who preoperatively had selected inhaled induction requested intravenous induction. Three children who preoperatively had been undecided opted for inhaled induction. In actuality, anesthesia was induced by needle and mask in 14(12%) and 103(88%) children ($p < 0.0005$), respectively (Table 2).

The route of previous anesthetic induction was elucidated in 44 of the 58 children who had undergone surgery previously. Twelve (21%) children had previously been induced by 'needle', of whom 7 and 5 children chose 'mask' and 'needle' inductions, respectively, for their forthcoming surgery. Six children had histories of multiple previous anesthetics, with experience of both mask and needle routes

Gender	N %	Previous surgery		Previous route of induction		
		Yes	No	Needle	Mask	Unknown
Males	66 56%	35 51%	31 49%	6 10%	19 33%	9 16%
Females	51 44%	23 49%	28 51%	6 10%	13 22%	5 9%
Overall	117	58 50%	59 50%	12 21%	32 57%	14 24%
p values		ns	ns	needle v mask <0.0005		
				needle v unknown <0.0005		
				mask v unknown <0.005		

Needle= intravenous induction
Mask= inhaled induction

Table 1: Demography 1. Numbers of children (males, females, overall) having had previous surgery and their previous route of induction.

Gender	N %	Choice of route of induction (N=117)				Actual Induction route (N=117)	
		Needle	Mask	Either	Unable	Needle	Mask
Males	66 56%	12 10%	32 27%	6 5%	10 9%	8 7%	57 48%
Females	51 44%	11 9%	30 26%	4 3%	12 10%	6 5%	43 38%
Overall	117 100%	23 20%	62 53%	10 9%	22 19%	14 12%	103 86%
p value	ns	needle v mask <0.0005				needle v mask <0.0005	

Needle=intravenous induction
Mask= inhaled induction

Either= child does not mind, either intravenous or inhaled induction
Unable= child unable to comprehend or unable to make an informed choice

Table 2: Demography 2. Numbers of children (males, females, overall) choosing intravenous or inhaled inductions of anesthesia, and numbers of children actually induced by intravenous and inhaled anesthesia.

of induction. Of these, 4 children chose inhalational and 2 chose IV induction, respectively. Of 32 children with histories of previous mask induction, 6 (19%) requested IV induction, 19 (59%) chose mask induction, 3 (9%) were unable to decide and 3(9%) did not mind which route was used on this occasion.

Analysis of data with respect to age and ability to choose between intravenous and inhalational induction of anesthesia revealed that no child <2 years of age was able to communicate preference. However, 1 of 9 two year olds, 2 of 8 three year olds, 5 of 6 four year olds and all children > 5 years of age were able to state a preference (Table 3).

Analysis of data with respect to age and eventual (actual) route of induction derived from the 23 children who chose intravenous induction of anesthesia revealed that children as young as 5 years of age may select needle induction. Two of the 3 five year olds who chose intravenous induction recounted adverse experience of recent inhalational induction of anesthesia. However, 5 (41%) of the 12 children who chose IV induction changed their minds in the operating room, and requested inhaled induction of anaesthesia (Table 4).

The offer of premedication was acquiesced to and declined by 64(55%) children and 21(18%) children, respectively, (p<0.0005), with 32(27%) children not being able to communicate preference in this regard. Parental recommendations for premedication occurred in 15 (13%) children, 12 of whom were boys and 3 were girls. Oral premedication was selected by the child recommended by the parent in all instances, and no child requested or parent recommended premedication by intramuscular injection (Table 5).

Discussion

Prospective audit is encouraged in the National Health Service in Great Britain and Ireland for quality control purposes as an alternative means of rationalizing routine clinical practices in all disciplines of

medical practice. This prospective, observational audit was undertaken in accordance with principles which have been suggested as being appropriate for such audit [2]. While prospective audit is occasionally used for quality improvement and research in the United States of America [3], it is widely used in the National Health Service of the United Kingdom of Great Britain and Ireland (and elsewhere) by many medical disciplines to rationalize practice [4-11] because it is not time-consuming or costly, and allows busy clinicians the facility to monitor and improve their practices without impacting or delaying workload [12].

We audited, primarily, the wishes and demographics of children for either an intravenous or an inhaled induction of anesthesia and, secondarily, their wishes to receive premedication before surgery. It was revealed that no child under the age of 2 years was able to state preference, that some children aged between 2 and 4 years were able to choose, and that all children > 5 years did state preference. Surprisingly, 23 (20%) children, some as young as 5 years of age, selected IV induction, while, unsurprisingly, a greater number of children, 19(59%), selected an inhalational induction. The remainder of the children audited were either unable to make a decision or expressed no preference. However, approximately half of those selecting IV induction during the pre-operative consultation refused IV cannulation in the operating room and were anesthetized by 'mask'. Overall, approximately 10% of children were induced by 'needle' and approximately 90% by 'mask'. Gender and previous anesthetic experience did not appear to influence decision-making. Approximately 50% of children accepted the offer of premedication, of whom no child selected to have this medication administered intramuscularly.

There is wide variation in the manner in which pediatric patients are prepared for surgery, with some institutions advocating psychological preparation using videos, books and pre-operative hospital visits [3]. Our hospital utilizes none of the foregoing, and children scheduled

Numbers (N) of children		Age (years)															
		<2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
N/year of age overall	117 (100%)	8	9	8	6	6	12	11	6	7	9	9	7	5	4	6	4
N/year of age unable to choose	22 (19%)	8	8	6	1	0	0	1*	0	0	0	0	0	0	0	0	0
N/year of age able to choose	95 (79%)	0	1	2	5	6	12	10	6	7	9	9*	7	5	4*	6	4
N/year of age with parent input	14 (12%)	0	3	1	1	1	0	3	0	2	1	1	0	0	0	0	0

* = one child per age group mentally disadvantaged.

N/year=number per year of age

Table 3: Demographics 3. Numbers of children per year of age able and unable to choose between intravenous and inhaled induction of anaesthesia, and numbers of parents contributing to the decision.

Numbers (N) of children		Age (years)															
		<2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
N selecting needle	23 (20%)	0	0	0	0	3	2	3	0	1	1	2	2	1	3	3	2
N actually induced by needle	13 (56%)	0	0	0	0	2	1	2	0	0	1	1	1	1	1	2	1
N eventually induced by mask	10 (44%)	0	0	0	0	1	1	1	0	1	1	1	1	0	1	1	1

(Needle= intravenous induction of anesthesia; mask= inhaled induction of anesthesia)

Table 4: Demographics 4. Numbers of children per year of age selecting intravenous induction of anesthesia and their eventual route of induction of anesthesia.

Total N	Numbers of children					
	N requesting premedication	N declining premedication	N unable to communicate	Selected premedication route		Parental input
117 (100%)	64 (55%)	21 (18%)	32 (27%)	64 (100%)	0 (0%)	15 (13%)

Oral= orally administered premedication; IV/IM= intravenously/intramuscularly administered premedication.

Table 5: Premedication. Numbers of children requesting, declining or unable to make a decision regarding premedication, their selected route for premedication and numbers of parents recommending premedication.

for ambulatory surgery, accompanied by their guardians, are usually first seen on the day of surgery in a DSU shared with adult patients also scheduled for ambulatory surgery. Further, in the absence of a consensus view as to the need and benefit for sedative premedication in pediatric anesthetic practice [4], it is our routine to offer oral sedative premedication and to induce anesthesia, with or without parental presence [5,6], by inhalation of a volatile anesthetic agent or IV injection of appropriate hypnotic.

It has long been recognized that guidelines for patient care based on patient preference are more likely to result in high quality care and patient satisfaction [7,8]. Accordingly, physicians involved in family medical practice have long espoused 'patient centered practice' [9], in which cognizance is taken of the opinions and preferences of the patient. These considerations have, more recently, resulted in the interest of anesthesiologists in optimizing patient care and satisfaction by exploring the perceptions, views and preferences of patients regarding their anesthetic care [10-12].

An extensive literature describes the epidemiology and behavior of children [13-15] and parents [5,6] in the preoperative room, but these data do not specifically address the issues of choice of route for induction of anesthesia, child's wish to receive premedication and associated epidemiological factors. Some texts have long taught that the anesthesiologist "should not present the child with unpleasant choices such as: 'do you want the needle or mask?' but should, at the same time try to meet the child's special requests [16]. Others suggest that verbal communication should be encouraged with children as young as 3 years of age [17], but also do not address the specific question of choice of route for induction of anesthesia.

The results of our study encourage us also to advocate a "child-centered" approach to the preoperative visit, premedication and induction of anesthesia, in which the child is empowered and encouraged to share in decision-making regarding aspects of their anaesthetic care. However, our data also demonstrates the necessity for flexibility on the part of the anesthesiologist with respect to the eventual route of anaesthetic induction. Seeking, and heeding, patient preferences may contribute to avoiding the occasional 'stormy' induction eloquently alluded to by a senior pediatric anesthesiologist colleague in our hospital when reviewing the protocol for this study on behalf of our Committee for the Protection of Human Subjects: "One does not expect children under 10 years to accept an IV and many will also not accept a mask, needing to be held down during induction of anesthesia by mask" [18]. Our findings confirm published opinion that children of much younger age may have opinions regarding aspects of their anaesthesia care [17], and, further, suggest it may be that failure to seek the preference of a child may be the cause of the child having no sense of control, and 'needing to be held down during induction by mask'.

These data suggest that opinion regarding their preferred route of induction of anesthesia and premedication be sought from children greater than 2 years of age at the preoperative visit, other factors notwithstanding. So doing may contribute to the child having a feeling of being in control and facilitate induction of anesthesia.

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