Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study



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Summary

Background Perioperative respiratory adverse events in children are one of the major causes of morbidity and mortality during paediatric anaesthesia. We aimed to identify associations between family history, anaesthesia management, and occurrence of perioperative respiratory adverse events.

Methods We prospectively included all children who had general anaesthesia for surgical or medical interventions, elective or urgent procedures at Princess Margaret Hospital for Children, Perth, Australia, from Feb 1, 2007, to Jan 31, 2008. On the day of surgery, anaesthetists in charge of paediatric patients completed an adapted version of the international Study Group for Asthma and Allergies in Childhood questionnairs. We collected data on family medical history of asthma, atopy, allergy, upper respiratory tract infection, and passive smoking. Anaesthesia management and all perioperative respiratory adverse events were recorded.

Findings 9297 questionnaires were available for analysis. A positive respiratory history (nocturnal dry cough, wheezing during exercise, wheezing more than three times in the past 12 months, or a history of present or past eczema) was associated with an increased risk for bronchospesm (relative risk [RR] 8-46, 95% CI 6-18-11-59; p<0-0001), laryngospasm (4-13, 3-37-5-08; p<0-0001), and perioperative cough, desaturation, or alrway obstruction (3-05, 2-76-3-37; p<0-0001). Upper respiratory tract infection was associated with an increased risk for perioperative respiratory adverse events only when symptoms were present (RR 2-05, 95% CI 1-82-2-31; p<0-0001) or less than 2 weeks before the procedure (2-34, 2-07-2-66; p<0-0001), whereas symptoms of upper respiratory tract infection 2-4 weeks before the procedure significantly lowered the incidence of perioperative respiratory adverse events (0-66, 0-53-0-81; p<0-0001). A history of at less two family members having asthma, atopy, or smoking increased the risk for perioperative respiratory adverse events (all p<0-0001). Risk was lower with intravenous induction compared with inhalational induction (all p<0-0001), alrway management by a specialist psediatric anaesthetist compared with a registrar (all p<0-0001), and use of face mask compared with tracheal intubation (all p<0-0001).

interpretation Children at high risk for perioparative respiratory adverse events could be systematically identified at the preanaesthetic assessment and thus can benefit from a specifically targeted anaesthesia management.

Funding Department of Anaesthesia, Princess Margaret Hospital for Children, Swiss Foundation for Grants in Biology and Medicine, and the Voluntary Academic Society Basel.

Introduction

Despite the development of guidelines for anaesthesia management, perioperative respiratory adverse events remain one of the major causes of morbidity and mortality during paediatric anaesthesia. ¹⁴ Many factors related to a child's medical history, anaesthesia management, and surgery contribute to their occurrence. Although previous studies have reported some risk factors for perioperative respiratory adverse events, ²⁴⁴ whether children at high risk are being identified in clinical practice is uncertain.

Increased airway sensitivity, which can be associated with current asthma, recent upper respiratory tract infection, or passive smoking, probably increases the risk of perioperative respiratory adverse events. The incidence of upper respiratory tract infection in children presenting for anaesthesia is high* and the prevalence of asthma is increasing in the peediatric population, thus anaesthetists have to manage increasing numbers of children at high risk of perioperative respiratory adverse

events in everyday clinical practice. However, most paediatric studies have focused on a specific population, "a specific condition (eg, upper respiratory tract infection)," or the incidence of specific complications, particularly laryngospasm, ""

Accurate assessment of the risk of perioperative respiratory adverse events during the preanaesthetic assessment would enable anaesthetic management to be tailored to reduce the likelihood of those complications. A suitable risk assessment question naire that could be useful, especially because perioperative consultations are changing from being medically-based to nurse-based.

We aimed to identify any associations between family history, anaesthesia management, and occurrence of perioperative respiratory adverse events by assessing children preoperatively with an adapted version of the International Study Group for Asthma and Allergles in Childhood (ISAAC) questionnaire.

See Comment page 745 Department of Anamah Princess Margaret Hospital for Children, Portin, WA, Australia (Prof 6.3 von Ungern-Stemberg PhD, N A Chambers MD, G Rebmann MD, G Johnson MQ); Division of Clinical Action Twistness institute for Child Health Research, and Contro to Child Health Res (9.5 von Ungern-Stamberg, Prot PD StyPhD), and School of ine and Pharma (B.8 von Ungern-Sternberg), University of Wester stralia, Parth, WA, A Department of Medical Informatios, University of Szeged, Szeged, Hungary (KBoda PhD); and Paediatrio

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Methods Study design

We prospectively included all children who had general anaesthesis for surgical or medical interventions, elective or urgent procedures at Princess Margaret Hospital for Children, Perth, Australia, from Feb 1, 2007, to Jan 31, 2008. On the day of surgery, the anaesthetist in charge of the patient used the modified ISAAC questionnaire" to record upper respiratory tract infection, including time of the infection (present, <2 weeks earlier, or 2-4 weeks earlier) and the symptoms involved (clear or green runny nose, fever [body temperature >38°C], and dry or moist cough); asthma and wheezing in the past 12 months (including the number of wheezing attacks) or wheezing with exercise; nocturnal dry cough persisting for more than 2 weeks in the past year; present or past hayfever, eczema, or allergy; passive smoke exposure; and the occurrence of asthma, eczema, or hayfever in first-degree relatives. Full details of the type of procedure, the level of experience of the anaesthetist in charge of airway management, anaesthetic management, and postoperative care were also recorded. The webappendix shows the modified questionnaire and the data collection sheet.

Questionnaires were attached to the anaesthesia record and were completed by the anaesthetist in charge of the patient. An interpreter was available if needed to overcome language difficulties in familles whose first language was not English. The anaesthetists were not masked to patient information when completing the questionnaire because it formed part of the preoperative assessment and we cannot ethically exclude such information. However, anaesthetists were not aware of the study hypotheses until the data collection was completed. Ansesthesia management was left to the discretion of the anaesthetist in charge with no restrictions or guidelines imposed by the study. We used the ISAAC questionnaire " for all the items related to bronchial hyper-reactivity, asthma, and allergy and added information about passive or active smoking,

We documented all perioperative respiratory adverse events and their time of occurrence (during anaesthesia induction, during maintenance of anaesthesia, at emergence from anaesthesis, or in the postanaesthetic care unit). All episodes of laryngospasm, bronchospasm, airway obstruction, oxygen desaturation (<95%), and severe or sustained cough were reported as perioperative respiratory adverse events. Children were also assessed in the postanaesthetic care unit for the occurrence of stridor. Laryngospasm was defined as complete airway obstruction associated with muscle rigidity of the abdominal and chest walls. Bronchospasm was defined as increased respiratory effort, especially during expiration, and wheeze on auscultation. Airway obstruction was defined as the presence of partial airway obstruction in combination with a snoring noise and respiratory efforts. We recorded any treatment that was needed in response to perioperative respiratory adverse events.

After approval by the institutional athles committee, this study was done as a quality of care audit and parental consent was waived because no change to standard management was involved.

Statistical analysis

Statistical analysis was done with SPSS (version 15.0). We did univariate statistics with the Mann-Whitney U test for continuous variables and the χ^2 test for categorical variables. For all analyses, we used two-sided tests, with p values less than 0-05 denoting statistical significance. We adjusted p values by the step-down Bonferroni method with SAS (version 9.1.3).

We developed multivariate models for perioperative bronchospasm, laryngospasm, and all other complications as dependent variables. There were many possible independent candidate variables, and therefore development of the multivariate models needed variable selection to avoid problems of redundancy and overspecification. We chose the independent variables in the multivariate models on the basis of uncorrected p values of the univariate tests (p<0.05) and on medical considerations; some variables with a p value less than 0.05 were not included into the set of candidate-independent variables. Categorical variables with several categories were transformed to binary variables along the highest relative risk (RR) following the univariate testing.

When independent variables are correlated, there are difficulties in estimation of model coefficients; the greater the multicollinearity, the greater the standard errors. To avoid multicollinearity, the structure of the correlation of the candidate variables used in the multivariate model was examined first by factor analysis and resulted in five factors: variables associated with heightened alrway sensitivity (present or recent [<2 weeks] cold, wheezing with exercise, wheezing more than three times in the past 12 months, and nocturnal dry cough); present or past eczema; family history (asthma, rhinitis, or eczema in at least two family members, or both parents smokers): anaesthesia (management by registrar, inhalational induction, or change of anaesthetist during airway management); and otolaryngology procedures. Instead of producing new artificial variables by factor analysis, we collapsed original variables belonging to the factors using the OR logical operator. These collapsed variables were used in the multivariate analyses together with age and alrway management. Multivariate analysis was done by RR regression because this method is appropriate for modelling the risk factors of prospective studies. Multivariate analysis uses a generalised linear model with log-link function and binomial-dependent variable. Model fit was assessed by a likelihood ratio test with stepwise elimination process variables and possible interactions with age, and some medically plausible Interactions were also examined. Variables and their interactions remained in the model if they improved the model fit with the likelihood ratio test.

Multiple occurrences of risk factors were handled in two ways; highly correlated variables expressing similar clinical meanings were collapsed into one variable

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Percentages do not add up to 1901 ASA-American Society of American Table 1: Demographics and bee	kologista.		WTOLK	

and a multivariate analysis was done on these and other less correlated variables. By contrast, multiple occurrences of respiratory compilications were considered as separate events in the same patient unless otherwise stated. Any associations that lost significance after correction are reported as such in the text.

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Role of the funding source

The sponsors of the study had no role in the study design, data collection, data management, data analysis, data interpretation, or in the writing of the report. The corresponding author had full access to all the data in the study and had the final responsibility for the decision to submit for publication,

Results

After the 12 months, 9297 questionnaires (from 10496 children) were available for analysis. The mean age of the children was 6-21 years (SD 4-8), Tables 1 and 2 show demographic data and details of anaesthetic management.

1392 (15%) of 9297 children had perloperative respiratory adverse events: 193 (2%) had bronchospasm, 351 (4%) laryngospasm, 332 (4%) airway obstruction, 919 (10%) oxygen desaturation, 687 (7%) coughing, and 58 stridor (1%; table 3). Urgent procedures had a higher risk for perioperative respiratory adverse events than did elective procedures (17% [548 of 3291] vs 14% [848 of 6006]; RR 1•2, 95% CI 1•1–1•3; p=0•001).

The American Society of Anesthesiologists (ASA) physical status classification system is used in clinical practice to assess the risk for morbidity in paediatric anaesthesia. We used this system to assess risk in

9284 children, 201 (27%) of 750 children with a positive respiratory history versus 288 (8%) of 3815 of those with no Infection in the past 4 weeks in ASA 1 had perioperative respiratory adverse events; 389 (33%) of 1167 versus 279 (12-5%) of 2227 in ASA 2; and 104 (33-2%) of 313 versus 98 (11%) of 889 in ASA 3 (all p<0.0001). However, for children with ASA 4, five of 25 with a positive respiratory history had perioperative respiratory adverse events compared with 27 of 98 children without (p=0-61).

Table 4 shows the effect of different aspects of anaesthetic management on the risk for perioperative respiratory adverse events. The risk of perioperative respiratory adverse events was higher in children premedicated with midazolam than in those not premedicated; if anaesthesla was maintained with desflurane rather than sevoflurane; or if the cords were sprayed with lignocaine than if not (table 4). Maintenance with sevoflurane was not associated with an increased incidence of perioperative bronchospasm compared with propofol (RR adjusted for age 1-21, 95% CI 0-76–1-90; p=0-50) but was associated with a higher incidence of laryngospasm (2-37, 1-49–3-76; p<0-0001) independent of age (p for interaction=0-139). The risk for laryngospasm was higher when three or more attempts were required to secure the alrway than when the alrway was

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onâp	319 (5%)	368 (16%)	360 (312 to 415)	<0.0001	11-78% (10 18 to 13-38)
esaturation < 95%	455 (6%)	464 (21%)	3 18 (2 82 to 3 59)	<0.0001	14-11% (12-34 to 15-87)
irway obstruction	178 (3%)	154 (7%)	270 (219 to 333)	< 0.0001	4-30% (3 19 to 5 40)
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secured on the first attempt (table 4). However, the risk for stridor was not higher when three or more attempts were required (table 4).

When investigating the incidence of each individual respiratory complication, we could not detect any significant difference between the incidence of complications after removal of the tracheal tube or the laryngeal mask airway in awake or deeply anaesthetised children (data not shown). By contrast, the overall incidence of perioperative respiratory adverse events was higher in children who were awake when their laryngeal mask airway was removed and lower in those who were awake when their tracheal tube was removed (table 4); however, these differences were no longer detected with either device in the recovery room (table 4).

We noted a higher rate of perioperative laryngospasm in children who had an uncuffed tracheal tube than in those who had a cuffed tracheal tube (10% [122 of 1268] vs 3% [42 of 1616], RR adjusted for age 3-18, 95% Ct 2-14-4-73; p<0-0001). The rate of perioperative bronchospasm did not differ by use of uncuffed tracheal tubes compared with cuffed tracheal tubes (5% [63 of 1268] vs 3% [45 of 1616]; RR adjusted for age 1-08; 0-57-2-05; p=0.811), but in case of uncuffed tracheal tube, the Incidence of bronchospasm increased with age (RR adjusted for endotracheal tube by age interaction 1-10, 1-04-1-15; p=0-001). The incidence of stridor was lower when cuffed tracheal tubes were used (0% [six of 1400]) than when uncuffed tracheal tubes were used (4% [38 of 1039]; RR adjusted for age 0-22, 0-09-0-56; p=0-001), Independent of age (p for interaction=0.50).

In multivariate analyses, the major risk factors for perioperative respiratory adverse events were the collapsed variables positive respiratory history, eczema, family history (atopy and smoking), and anaesthetic management (tables 5-7). The risk for perioperative respiratory adverse events was higher when children were exposed to maternal smoking (RR 1-87, 95% CI 1.72-2.04; p<0.0001) or both parents smoking (2.09, 1-85-2-36; p<0-0001), it was lower when only the father smoked (1-19, 1-08-1-31; p=0-001) The risk factors for bronchospasm (table 5), laryngospasm (table 6), and other perioperative respiratory adverse events (table 7) were similar except that older children were less likely to have laryngospasm and other perioperative respiratory adverse events (cough, desaturation, or sirway obstruction) than were younger children. We noted no interactions between age, type of anaesthetic management, or positive respiratory history on the risk for perioperative respiratory adverse events (data not shown).

The risk for perioperative respiratory adverse events was higher for children with present or recent upper respiratory tract infection than for those who had not had a respiratory infection in the past 4 weeks (table 8). Parental reports of present fever were associated with increased risk of perioperative bronchospasm and other

perioperative respiratory adverse events and recent fever (<2 weeks) was associated with risk of laryngospasm compared with patients with no symptoms (table 9).

Discussion

Findings from this large prospective cohort study show that factors easily obtained at a preanaesthetic assessment, including respiratory symptoms, eczema, or a family history of asthma, rhinitis, eczema, or exposure to tobacco smoke, were associated with an increased risk for the occurrence of perioperative respiratory adverse events. Additionally, an upper

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Premedicated	635	151 (24%)	1 83 (1:58-2 13)	<0.0001†
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Sronchospasm .				
Sevofturane	6221	124 (2%)	1.00	
Isoflurane	1469	11 (1%)	0 38 (0 20-0 69)	0.0018#
Desflurane	318	39 (12%)	6 153 (4 37-8 70)	<0.0001†
aryngospesov				
Sevoflurane	6221	252 (4%)	100	
		202 (476)	100	
Isoflurane Oesflurane Oesflurane	1469 318	51(3%) 28(9%)	0-85 (0-84-1-15) 2-17 (1-50-3-15)	031 <00001†
Isoflurane Desflurane Desflurane Perioperative respiratory advivents	1469 318	51 (3%)	0-85 (0-64-1 15)	
bofturane Desflurane Desflurane Perioperative respiratory advivents Laryngeal mask akway	1469 318 	51 (3%) 28 (9%)	0-85 (0-84-1 15) 2-17 (1-50-3 15)	
boflurane Oesflurane Desflurane Perioperative respiratory advivents Laryngeal mask akway Destlurane	1469 318 erse 45	51 (3%) 28 (9%) 25 (56%)	0.85 (0.84–1.15) 2.17 (1.50–3.15)	<0.0001†
boffurane Cesfurane Perfairane Perioperative respiratory advivents Laryngeal mask airway Destfurane No desflurane	1469 318 	51 (3%) 28 (9%)	0-85 (0-84-1 15) 2-17 (1-50-3 15)	
boffurane Cesfturane Perioperative respiratory advisents Laryngeal mask akway Destfurane No destfurane Tractical tube	1469 318 45 5541	51 (3%) 28 (9%) 25 (56%) 567 (10%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14)	<0.0001†
boffurane Cesfturane Perioperative respikatory advivents Laryngeal mask airway Destfurane No destfurane Trachest tube Destfurane	1469 318 318 45 5541 273	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4 13-7 14) 1 28 (1 06-1 53)	<0.0001†
boffurane Desfurane Perioperative respikatory advivents Laryngeal mask airway Destlurane No desflurane Tracheal tube Desflurane No desflurane	1469 318 45 5541	51 (3%) 28 (9%) 25 (56%) 567 (10%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14)	<0.0001†
boffurane Desfurane Perfurane Perioperative respiratory advivents Laryngeal mesk sirway Destlurane No desflurane Tracheal tube Desflurane No desflurane No desflurane	1469 318 318 45 5541 273	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4 13-7 14) 1 28 (1 06-1 53)	<0.0001†
boffurane Desfurane Perfurane Perioperative respiratory advivents Laryngeal mesk sirway Destlurane No desflurane Tracheal tube Desflurane No desflurane No desflurane	1469 318 45 5541 273 2618	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 856 (25%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14) 1 28 (1 06-1 53)	<0.0001† <0.0001† 0.013\$
bofturane Desfiturane Perioperative respiratory advivents Laryngeal mask airway Destiturane No desfiturane Tracheal tube Desfiturane No desfiturane No desfiturane No desfiturane Occidentations Resettleste mainternames; Brotchtospasm	1469 318 45 5541 273 2618	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 659 (25%) 590701	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14) 1 28 (1-06-1 53) 1 00	<0.0001†
boffurane Desflurane Perioperative respiratory advisents Laryngeal mask airway Destlurane No desflurane Tracheal tube Desflurane No desflurane No desflurane No desflurane Recetheala maintananae; Secontospassas	1469 318 45 5541 273 2618	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 856 (25%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14) 1 28 (1 06-1 53)	<0.0001† <0.0001† 0.013\$
boffurane Desflurane Perioperative respiratory advisents Laryngeal mask airway Destlurane No desflurane Tracheal tube Desflurane No desflurane No desflurane No desflurane Recetheala maintananae; Secontospassas	1469 318 45 5541 273 2618	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 659 (25%) 590701	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4 13-7 14) 1 28 (1 06-1 53) 1 00 1 34 (0 83-2 15)	<0.0001† <0.0001† 0.013\$
boffurane Cesfurane Perioperative respiratory advisents Laryngeal mask sirway Destfurane No destfurane Tracheal tube Desfurane No desfurane No desfurane Sevoftwane Sevoftwane Propofol afyngospasm	1469 318 45 5541 273 2618 6221 1269	51 (3%) 28 (5%) 25 (56%) 567 (10%) 88 (32%) 890 (25%) 123 (2%) 19 (1%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7-14) 1 28 (1-06-1 53) 1 00	<0.0001† <0.0001† 0.013\$
boliurane Desfiturane Desfiturane Perioperative respiratory advivents Laryngeal mask sirway Destiturane No desfiturane Trachost tube Desfiturane No desfiturane No desfiturane No desfiturane Respiratory Sevofiturane Propofol Sevofiturane Propofol Sevofiturane Propofol	1469 318 45 5541 273 2618 8990 Barraine 145 pr 6221 1269	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 659 (25%) 123 (2%) 19 (1%) 251 (4%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7 14) 1 28 (1 06-1 53) 1 00 1 34 (0 83-2 16) 1 00 2 5D (1 66-4 0 8)§	<0.0001† <0.0001† <0.0001† <0.013\$
boliurane Desfiturane Perioperative respiratory advivents Laryngeal mask airway Destiturane No desfiturane Tracheal tube Desfiturane No desfiturane No desfiturane Anaesthesis maintanames; Bronhospasm Sevofiturane Propofol Sevofiturane Propofol Britishastad with mysoralsosane	1469 318 45 5541 273 2618 8990 Barraine 145 pr 6221 1269	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 659 (25%) 123 (2%) 19 (1%) 251 (4%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7 14) 1 28 (1 06-1 53) 1 00 1 34 (0 83-2 16) 1 00 2 5D (1 66-4 0 8)§	<0.0001† <0.0001† <0.0001† <0.013\$
boliurane Cesifurane Perioperative respiratory advivents Laryngeal mask airway Destiurane No destiurane Tractical tube Destiurane No destiurane No destiurane Sevolturane No destiurane No destiurane No destiurane No destiurane No destiurane Sevolturane Propofol Leryngospasm Sevofturane	1469 318 45 5541 273 2618 8990 Barraine 145 pr 6221 1269	51 (3%) 28 (9%) 25 (56%) 567 (10%) 88 (32%) 659 (25%) 123 (2%) 19 (1%) 251 (4%)	0 85 (0 84-1 15) 2 17 (1 50-3 15) 1 00 5 43 (4-13-7 14) 1 28 (1 06-1 53) 1 00 1 34 (0 83-2 16) 1 00 2 5D (1 66-4 0 8)§	<0.0001† <0.0001† <0.0001† <0.013\$

3ronchospasm Sprayed	558	38 (7%)	2:17 (1:48-3:19)	<0.00011
Not sprayed	2234	70(3%)	1:00	-0'00011
árymgospasm				
Sprayed	558	62(11%)	2-89 (2-10-3-95)	<0.0001t
Not sprayed	2234	86 (4%)	1:00	
Urway (Nanagament	phytodenia);	www.miningenet	(#19000000000000000000000000000000000000	wancecourage (s)
tridor	e april a mere i mare		Michigan Mark Color	******************
Registrar	6012	45 (1%)	1-61 (0-87-2-99)	0 156
Consultant	2802	13 (0%)	1-00	
Alrway device inverted excess	fully in the contract of	202500000000000	24/4/4/4/4/4/99/7/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/	Mitter Programme
erkoperative laryngospasm				* *************************************
After 3 or more attempts	198	28 (14%)	4-25 (2-95-6-14)	<0.0001†
At first attempt	7006	233 (3%)	1.00	
Stridor				
After 3 or more attempts	183	2(1%)	2:00 (0:49-8:25)	0.27
At first attempt	6596	36 (1%)	1.00	
temoving device		dynamanini		(Markon Hiller)
Perioperative respiratory adverse	everits			
Removing taryngsal mask airw	rây			
Awake	2855	333 (12%)	1-28 (1-10-1-50)	0.001**
Under deep anaesthesia	2705	246 (9%)	1.00	
Removing tracheal tube				
Awake	157 8	352 (22%)	0 75 (0 66-0 85)	<0.0001††
Under deep angestheals	1277	381 (30%)	\$·00	
Removing laryngeat mask airw	ray or tracheal i	tube in the recover	y room	
Awake	4433	214 (5%)	1:12 (0:91-1:38)	0-27
Under deep anaesthesia	3 982	172 (4%)	1:00	

respiratory tract infection was associated with an increased risk for perioperative respiratory adverse events only when the symptoms were present or had occurred within the 2 weeks before the procedure. These risk factors could form a risk assessment for perioperative respiratory adverse events that would allow anaesthetic management to be tailored to a child's risk profile. This study also emphasised the importance of the effect of skilled anaesthesia management by consultant paediatric anaesthetists on the prevention of perioperative respiratory adverse events, particularly when intravenous anaesthesia and non-invasive sirway devices were used.

Our goal was to identify risk factors that are easily detectable during the preanaesthetic assessment by use of a validated questionnaire adapted to the anaesthetic environment. The anaesthetists were not masked to patient information when completing the questionnaire; thus, we cannot exclude the possibility that asking the

relevant questions might have potentially affected the subsequent anaesthetic management. We attempted to keep to a minimum the effect of potential confounding results from highly associated risk factors by using combined variables in the multivariate analyses.

This study shows that a positive respiratory history is a better predictor for the occurrence of perioperative respiratory adverse events in paediatric anaesthesia than the ASA physical status. Additionally, the risk within each ASA category was higher in children with a positive respiratory history than in those without. Age also influenced the risk for perioperative respiratory adverse events, particularly laryngospasm, with the relative risk decreasing by 11% for each yearly increase in age (data not shown).

A positive respiratory history was more predictive for bronchospasm and, to a lesser extent, for laryngospasm than for other perioperative respiratory adverse events. The risk for bronchospasm was ten times higher in patients with nocturnal dry cough than in patients without. Similarly, a personal history of eczema increased the relative risk for bronchospasm, which might be explained by the fact that eczema, especially in older children, is frequently associated with stopy, present wheeze, and asthma, "A personal history of hayfever was also associated with an increased risk for bronchospasm, which underlies the potential association between atopy and perioperative bronchospasm.

In agreement with previous studies, a present or recent upper respiratory tract infection increased the risk for perioperative respiratory adverse events, particularly for laryngospasm. 53.6 Additionally, symptoms of upper respiratory tract infection-including moist cough, green runny nose, and fever-ware associated with increased rates of perioperative respiratory adverse events. This significantly higher incidence of such adverse events in children with a present or recent upper respiratory tract infection might be attributed to alrway inflammation, interaction with the autonomic nervous system, and consecutively to airway sensitivity induced by the upper respiratory tract Infection, which lasts for several weeks in some patients.** Although the timing for the peak occurrence of perioperative respiratory adverse events and the decision of how long to postpone surgery is still debated, *** this study provides evidence that the high risk for perioperative respiratory adverse events is limited to the first 2 weeks after an upper respiratory tract infection and thus rescheduling a patient 2-3 weeks after upper respiratory tract infection would be a safe approach. This recommendation is in line with previous studies." suggesting that there is no increase in the incidence of perioperative respiratory adverse events in children with an upper respiratory tract infection more than 2 weeks before the procedure

Lower respiratory tract signs, comorbidities, and the type of procedure need to be considered when scheduling

are automical desirations by	Yes, (1)		k (je Mo okto) (iji)	MGCaacceway	FOR (95% CD)	p value	FR (95% CB)	p valu
	Total	();(Value ();((),())	Total	Value				
On (News)) of the speciment of the expression of	588 (501	0 (P)/NEBRORRE	622(4	61) (************************************	0.99 (0.96-1.02)	033		. igranikaj sa
lale	5554	96 (2%)	3743	97 (3%)	0 67 (0 51 -0 88)	0.004	*	1000
aylavar (1)	1163	57 (5%)	() eoee	136 (2%)	2 92 (2 15-3 95)	<0.0001	laküle ergeyişçi.	are William
outive respiratory history								
Upper respiratory tract infection <2 weeks	969	35 (4%)	8420	158 (2%)	2 15 (1:50-3:08)	<0.0001		
Wheezing at exercise	B72	86 (10%)	8386	107 (1%)	7-73 (5-87-10-18)	<0.0001		
Wheezing >3 times in past 12 months	478	54 (11%)	6619	139 (2%)	7 17 (5 31 - 9 68)	<0.0001		
Nocturnal dry cough	1161	116 (10%)	0100	77 (1%)	10 51 (7-93-13-93)	<0.0001		
Any of the above	2256	141 (6%)	7041	52 (1%)	8 46 (6 16-11 59)	<0.0001	5 65 (4-09-7-82)	<0.00
Zema				9-9-04	COCHAN TELEVISION AND AND AND AND AND AND AND AND AND AN		Magalitanan di	37.5
in the past 12 months	1307	66 (5%)	7942 (0)(4)	127 (2%)	3 16 (2 38-4 23)	<0.0001		erit ja j ak
Ever (excluding past 12 months)	2161	112 (5%)	7638	79 (1%)	4.58 (3.44-6.08)	<0.0001		7
Any of the above	2235	114 (5%)	7021	79 (1%)	4-53 (3-42-6-02)	<0.0001	2-80 (1-95-3-47)	<0.00
amily history							,	
Asthma in ≥2 family members	571	37 (6%)	8040	118 (1%)	4-42 (3-08-6-33)	< 0.0001		
Rhinitis in ≥2 family members	349	22 (6%)	6336	140 (2%)	3 75 (2 43-5 81)	<0.0001		
Eczema irr≥2 famity members	210	8 (4%)	8507	148 (2%)	2·19 (1·09-4·40)	0 025		
Both parents amokers	1075	49 (5%)	R222	144 (2%)	2 60 (1 89-3 58)	<0.0001		
Any of the above	1808	80 (4%)	7489	113 (2%)	2-93 (2-21-3-89)	<0.0001	1-86-(1-41-2-46)	<0.00
count and a	1000 1000 m. 1000 Color vienas (1777)		27927924X 242249774	Weller Haller		al (1304)	ACK, Hillarderske	odaba
Altway microged by registrar	8219	171 (3%)	3078	22(1%)	365 (247-598)	<0.0001	dygyr-il le feit	60 000 100 100 60 000 100 100 100 100 100 100 100 100 1
translationer induction of areasthesis c	3597	116 (3%)	6685	77(1%)	2:38 (1:75-3-17)	<0.0001		elis i wit
Change of ansesthesiologist, during	269	21 (8%)	9021	172 (2%)	4 09 (2 65-6 34)	<0.0004	Manalik (d	(()
elrway menegement	<u> (2014) (14.74)</u>						n awali dirice.	Jana,
Any of the above management at all the species of surgery	7396	181 (2%)	1899	12(1%)	3 87 (2 16-6 93)	<0.0001	3 08 (1 73-5 48)	0.00
Otolaryngology	1100	D4 (D8)	***					
Charles and the State of the Control	11 89 	34 (3%)	8108 	159 (2%)	1 46 (1:01-2:10)	0043		
ifvely management davke vand Lafyngen mask ve face mask	Teene		() () () () () () () () () () () () () (Average at the Section of A		
Tracheel Lube vs face mask	5586	79 (1%)	820	6(1%)	1-93 (0-85-4/42)	012	1 54 (0 68-3 49)	South to 1 1.
A STATE OF THE PROPERTY OF T	2891	108 (4%)	820	6(1%)	511(225-1157)	<0.0001	3 52 (1 56-7 94)	0.00
te are meen (SD) or number (%). RRemainlys (1	el: "840 0001 M	be armation by th	e stanufoum Ros	Button continued to a	. O segemente estado de la composição de l	more that with the	energy and the second	9.4000

surgery for a child with a recent upper respiratory tract Infection. A history of wheezing with exercise or more than three episodes in the past 12 months was associated with a greater risk of perioperative bronchospasm compared with the presence of a recent upper respiratory tract infection. These findings might be related to the presence of increased airway sensitivity, possibly caused by underlying chronic airway inflammation.

Although a family history of asthma and allergy has been suggested to increase the prevalence of these diseases. In children, male its effect on perioperative respiratory adverse events is unknown. In this study, the presence of asthma in at least two family members was associated with a significantly Increased relative risk of bronchospasm. Moreover, eczema, rhinitis, or asthma in at least two family members increased the risk of potentially life threatening complications (laryngospasm and bronchospasm) by nearly three

times. This study shows that a family history of allergy or asthma is an independent risk factor for perioperative respiratory adverse events. Previous studies identified exposure to tobacco smoke as a risk factor for perioperative respiratory adverse events. ***** Data from this study provide further insight into the effect of the smoking habits of different family members; the risk for perioperative respiratory adverse events was higher when children were exposed to maternal smoking or both parents smoking than when only the father smoked. These findings might be related to the difference in exposure to tobacco smoke from the primary caregiver. Previous reports have suggested that the risk of heightened bronchial responsiveness is highest if both parents smoke.***

The importance of management of anaesthesia by specialist paediatric anaesthetists to decrease perioperative respiratory adverse events has been

	University (Jimmiya (Key		(8), 17, 17, 17, 17, 17, 17, 17, 17, 17, 17	denisiasiANE	MARIN 750050	Multivarious vo.	.e97-60-87-7
	Total	Value	No.	Value	RR (95% CI)	ini property	RR (05% CI)	o valu
00 - 100 100 100 100 100 100 100 100 100 1	408 (4227)		6 30 (4 82		089 (087-092)	<0.0001	0.00.00.00.00.00	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
Agle	5554	191 (3%)	3743	160 (4%)	0.81(0.66-0.99)	0038	0-90 (0-86-0-83)	4000
Light Control	1163	45 (4%)	6088	302 (3%)	104(076-141)	···:::::::::::::::::::::::::::::::::::	Newson improved and	and respectively.
ositive respiratory history		(1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		The second Christian	11 i ež (e i e i ži)ii.):			
Upper respiratory tract infection <2 weeks	869	90(10%)	8420	261 (3%)	3 34 (2 66-4 20)	<0.0001		
Wheezing at exercise	872	89 (10%)	8386	261 (3%)	3 26 (2 61-4 13)	<0.0001		
Wheezing >3 times in past 12 months	478	44 (59%)	8819	307 (3%)	2 64 (1 96-3 58)	<0.0001		
Nocturnal dry cough	1161	127 (11%)	8100	223 (3%)	397 (322-490)	<0.0001		
Any of the above	2256	200 (9%)	7041	151 (2%)	413 (337-508)	<0.0001	3 26 (2 65-4-01)	<0.00
czementy providenty (p. 1861) był staliczny (p. 1861).	Birtholis (1994)	www.		(vajviji ili) (iv)	Maritiment en et en e	ogoponia de la composición del composición de la composición de la composición de la composición de la composición del composición de la c	10.000000000000000000000000000000000000	2000 (2000) 1000 (2000)
In the past 12 months	1907	84 (6%)	7942	267 (3%)	191(1:51-243)	=0 0000t		
Ever (excluding past 12 months)	2181	126 (6%)	7036	220 (3%)	1-85 (1-49-2-29)	=0.0001	The American Constitution (A)	7 (γ.
Arry of the above	2235	133 (8%)	7021	218 (3%)	192 (155-237)	-000001		V
amily bistory				* * * * * * * * * * * * * * * * * * * *		11, 7, 2, 222 11	and the control of	,
Asthma in ≥2 family members	571	61 (11%)	8040	228 (3%)	3-77 (2-88-4-93)	<0.0001		
Rhinitis in ≥2 family members	349	35 (10%)	8336	269 (3%)	3 12 (2 22-4 35)	<0.0001		
Eczema in 22 family members	210	23 (11%)	8507	298 (4%)	3 13 (2 09-4-67)	<0.0001		
Both parents smokers	1075	29 (9%)	8222	252 (3%)	3 01 (2 40-3 76)	<0.0001		
Arity of the above	1808	158 (9%)	7489	193 (3%)	3 39 (2 77-4 16)	<0.0001	2-57 (2-10-3-15)	*0.00
recitable.			77.00000000000000000000000000000000000	Anger geriebligen Anger States		Harriot in		WWW BAY
Alfway managed by registrar	6219	290 (5%)	3076	61 (2%)	235(179-309)	<0.0001	H. P.	
Inhelational industrian of amountmosts	3597	225 (7%)	5686	116(2%)	3-20 (2:57-3-96)	-00001		1 197190 75 15 15 1 1 10 10 10 10 10 10 10 10 10 10 10 10 10
Change of ansasthasiologist curing already management	289	41(10%)	9021	(307.(3%)	448 (331-606)	-0 0001	British Balakta	Maria di Ba
Any of the above	739 6	331 (4%)	1899	ren fema	0, 10, 100, 100, 100, 100, 100, 100, 10			HMMDarve XV
ype of surgery		· interest districts		20 (1%)	4 25 (2 71-6 65)	<0.0001	3-10 (1-99-4-84)	<0.000
Otolaryngology	1169	75 (6%)	8108	276 (3%)	1.85 (1.45-2.37)	<d:0001< td=""><td>1 20 (1 01 1 60)</td><td></td></d:0001<>	1 20 (1 01 1 60)	
irway managament device used:	an ing projection and the second	april/www.py		minintegralia	Company of the Self of the Sel	~D(AD)1	1 29 (1 01-1-66)	0.04
Larymgood meak vaface musik	5586	183 (3%)	820	4 (0%)	672(250-1804)	400001	5-23 (1.95-13-90)	, in the many of a
Tracheel tube veface mask	2891	164 (6%)	820	4(0%)	11-63 (4:33-31/26)	<0.0001	757(283-2030)	000
wantan ing katawa katawa kataba	Catherine	Sec. 10. 10. 10. 10. 10. 10. 10. 10. 10. 10		Victoria (m. 6)	Charles and Company of the Company o		Property of the control of the contr	<000X
fil are moon (80) or number (%). व्हिन्संस	ve nek, p. 0.0001	etter correction	by the step-skow	, Bonteroni m	ethod, fp=10 after correction	2p=0-052 after cor	region, SpeD 004 after con	witen.

debated. *** This study confirms the increased risk for perioperative respiratory adverse events when a patient has been cared for by a registrar, and underlines the further increased risk when the registrar failed to secure the airways. We reported an Increased risk of perioperative respiratory adverse events associated with otolaryngology surgery.** and with urgent procedures. The type of anaesthesia induction seemed to greatly affect the risk for perioperative respiratory adverse events; intravenous induction (propofol) was associated with a significantly lower incidence of perioperative respiratory adverse events than was inhalational induction (sevoflurane), particularly with regard to the occurrence of laryngospasm. Although extrapolation of the results to one intervention is difficult because most children might be taking a combination of drugs between induction and maintenance and might be

given different airway devices, our results suggest that intravenous anaesthesia might be associated with lower incidence of perioperative respiratory adverse events.

Additionally, proposol used as a maintenance drug was better at prevention of perioperative respiratory adverse events than sevosiurane," whereas the use of desflurane was associated with a significant increase in perioperative respiratory adverse events. This finding is not surprising because we recently showed that the use of desfurane in children was associated with an increase in airway resistance in children, particularly in those with helghtened airway sensitivity." In agreement with the strong bronchodilating effects of isoflurane, "" the incidence of bronchospasm was significantly lower when this drug was used to maintain anaesthesia. The incidence of all perioperative respiratory adverse events, particularly laryngospasm, is increased after direct

Total Value Valu		Y ••(2006)(2006)	An away on a	No	160 (2.00)	RR (95% CB)	p value	RR (95% Co	o veke
Table 12 State 12 Sta	. Harriston (m. 1907). Propinski sakali (m. 1907). 1907 - Propinski sakali (m. 1907). Propinski sakali (m. 1907).	Yotal westers in	Vskie	Total (in)	Voke				
######################################		495 (467)		641 (481)		094 (093-095)	<0.0001	0.95(0.04-0.98)	<0.000
Oblive respiratory history Upper respiratory tract infection 889 215 (25%) 8420 1056 (15%) 1-97 (1-73-224) < 0 0001 - 2 weeks 872 306 (35%) 8386 967 (12%) 3.04 (2.73-3.29) < 0 00001 - Wheeling at exercise 872 306 (35%) 83819 1119 (13%) 257 (2.24-2.98) < 0 00001 - Wheeling at Exercise 12 months 478 158 (33%) 8319 1119 (13%) 257 (2.24-2.98) < 0 00001 - Noctureal dry cough 1161 421 (36%) 8100 833 (11%) 3.44 (3.12-3.80) < 0 00001 - Any of the above 2256 630 (2.6%) 7041 645 (9%) 305 (276-3.37) < 0 00001 2.37 (2.14-2.62) < 0 00001 - Ever (antivating plass 12 months) 1507 300 (23%) 7942 566 (12%) 169 (16%) 177 (16.86-1.97) < 0 00001 - Ever (antivating plass 12 months) 2 225 465 (27%) 7028 996 (11%) 177 (16.86-1.97) < 0 00001 - See (antivating plass 12 months) 2 225 465 (27%) 7021 801 (11%) 162 (164-2.02) < 0 00001 - Any of the above 2225 465 (27%) 7021 801 (11%) 162 (164-2.02) < 0 00001 - Any of the above 571 160 (28%) 8336 998 (12%) 2 30(192-2.75) < 0 00001 - Example in 22 family members 571 160 (28%) 8336 998 (12%) 2 30(192-2.75) < 0 00001 - Example in 22 family members 10.75 259 (24%) 8222 1016 (12%) 156 (17%-2.20) < 0 00001 - Any of the above 1808 427 (24%) 7489 848 (11%) 2 99 (188-2.32) < 0 00001 - Any of the above 7388 1190 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 165 (15%) 50378 250 (15%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 169 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 169 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 169 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 169 (15%) 5686 567 (10%) 199 (170-2.20) < 0 00001 - Any of the above 7388 1190 (15%) 169 (15%)	ACCULANT Martin Colonia, and and a community of	5564	787 (14%)	3743	508 (14%)	1 02 (0 92-1 13)	0.74		
Upper respiratory tract infection 889 215 (25%) 8420 1056 (19%) 1-97 (173-224) <00001 - 22 weeks 22 306 (35%) 8386 967 (12%) 3.04 (273-3-29) <00001 - 237 (214-282)	The second of th	1163	209 (18%)	6088	1052 (13%)	1-36 (1-21-1-56)	<0.0001	Maria de la companio	وإتعالتهلين
**************************************	. , .,								
Wheating >3 lines in past 12 months 478 156 (33%) 8819 1119 (13%) 2 57 (2 24-2 96) <0.0001		869	215 (25%)	8420	1056 (13%)	1.97 (1.73-2.24)	<0.0001		
Wheating >3 (times in past 12 months 478 156 (33%) 8819 1119 (13%) 2 57 (2 24-2 96) <0.0001 Nocturnal dry cough 1161 421 (36%) 8100 853 (11%) 3 44 (3 12-3 80) <0.0001 Any of the above 2256 630 (28%) 7041 645 (8%) 3 00 (2 76-3 37) <0.0001 2 37 (2 14-2 62) <0.0001 Internal property	Wheezing at exercise	872	306 (35%)	6396	967 (12%)	3.04 (2.72-2.20)	e0.0004		
Nocturnal dry cough Any of the above 2256 630 (28%) 7041 645 (9%) 3-06 (276-3-37) <0.0001	Wheezing >3 times in past 12 months	478				,			
Any of the above 22% 630 (28%) 7041 645 (9%) 3-05 (276-3-37) <0.0001 2-37 (244-262) <0.0001 contains 12 moreths 1907 300 (23%) 7942 866 (12%) 1-69 (1-66-2-12)	Nocturnal dry cough	1161	, ,	8100	, , , , ,				
### Septiminary 1.007 1.00	Any of the above	2256	630 (28%)	7041	, ,			2:37 (2:14-2:82)	<0.000
Ever (axtikuting past 12 months) 2181 442 (20%) 7038 906 (11%) 1-77 (1:89-1-97) 50 0001 Any of the above 2235 465 (21%) 7021 801 (11%) 1-82 (1:64-202) <0.0001 1.25 (1:14-1:36), <0.001 Any of the above 32 (amily members 571 160 (28%) 8040 883 (11%) 2.55 (2.21-2.89) <0.0001	7-11-		(0.000000000000000000000000000000000000	75000000000		HANATA MANAMANA			,),(P)(P(P)
Any of the above 235 465 (21%) 7021 801 (11%) 1.82 (1.64-2.02) < 0.0001 1.25 (1.14-1.36) < 0.0001 milly history Asthma in 22 family members 571 160 (28%) 8040 883 (11%) 2.55 (2.21-2.95) < 0.0001 Eczema in 22 family members 349 96 (28%) 8336 998 (12%) 2.30 (1.92-2.75) < 0.0001 Eczema in 22 family members 710 75 (30%) 8507 1005 (12%) 302 (2.50-3.66) < 0.0001 Eczema in 22 family members 710 75 (30%) 8507 1005 (12%) 302 (2.50-3.66) < 0.0001 Eczema in 22 family members 710 75 (30%) 8507 1005 (12%) 302 (2.50-3.66) < 0.0001 Eczema in 22 family members 710 75 (25%) 7489 848 (11%) 2.09 (188-2.32) < 0.0001 1.55 (1.40-1.70) < 0.0001 Eczema in 2.6000 1 1.55 (1.40-1.70) Eczema in 2	And the second of the Conference of the Conferen	1307	300 (23%)	7942	966 (12%)	1-89 (1-66-2-12)	<0.0001	skatel Mai i	9:10:00 A.
Asthma in ≥2 family members 571 160 (28%) 8040 883 (11%) 2.55 (2.21-2.85) <0.0001 Ribridits in ≥2 family members 349 96 (28%) 8336 998 (12%) 2.30 (1.92-2.75) <0.0001 Eczena in ≥2 family members 710 75 (36%) 8507 1005 (12%) 3.02 (2.50-3.66) <0.0001 Both parents smokers 1075 259 (24%) 8222 1016 (12%) 1.95 (1.73-2.20) <0.0001 Any of the above 1808 427 (24%) 7.489 848 (11%) 2.09 (1.88-2.32) <0.0001 1.55 (1.40-1.70) <0.0001 Anway managed by registrat 6219 1015 (15%) 3078 260 (8%) 1-93 (1.70-2.20) <0.0001 1.55 (1.40-1.70) <0.0001 Unhalestonel induction of ameritansis. 3597 707 (20%) 5586 577 (10%) 1.97 (1.76-2.18) <0.0001 1.20 (1.92-2.12) <0.0001 Charge of Ameritansiopist curring 289 150 (65%) 9021 (1.22 (12%) 4.48 (3.98-6.05) <0.0001 1.80 (1.92-2.12) <0.0001 Any of the above 7368 1140 (15%) 1899 135 (7%) 2.17 (1.60-2.57) <0.0001 1.80 (1.92-2.12) <0.0001 Charge of surgery Chalayngology 1189 276 (23%) 8108 999 (12%) 1.88 (1.67-2.12) <0.0001 1.10 (0.99-1.22) 0.0001 Laryngology 1189 276 (23%) 8108 999 (12%) 1.88 (1.67-2.12) <0.0001 1.10 (0.99-1.22) 0.0001 Tachnal tube vir face mask 5596 520 (9%) 820 53 (6%) 3.76 (2.87-4.91) <0.0001 2.70 (2.07-3.53) <0.0001	Ever (excluding past 12 months)	2181	442 (20%)	7038	906 (11%)	1 77 (1:50-1:97)	<0.0001		
Asthma in 22 family members. 571 160 (28%) 8040 883 (11%) 2 55 (221-2.89) <0.0001 Rhinitis in 22 family members 349 96 (26%) 8336 998 (12%) 2 90 (192-2.75) <0.0001 Eczena in 22 family members 710 75 (36%) 8507 1005 (12%) 3 02 (2.50-3.86) <0.0001 Both parents smokers 1075 259 (24%) 8222 1016 (12%) 195 (173-2.20) <0.0001 Any of the above 1808 427 (24%) 7489 848 (11%) 2 99 (188-2.32) <0.0001 1.55 (1.40-1.70) <0.0001 Any of the above 1808 427 (24%) 7489 848 (11%) 2 99 (188-2.32) <0.0001 1.55 (1.40-1.70) <0.0001 Anively managed by registra: 6219 1015 (15%) 3076, 250 (8%) 1:83 (1.70-2.20) <0.0001 Anively managed by registra: 3597 707 (20%) 5686 567 (10%) (1.97 (178-2.48)) <0.0001 Charge of Anaesthesiologist coving 269 150 (66%) 9021 (122 (12%) 4-48 (3.98-6.05) <0.0001 Any of the above 7368 1140 (15%) 1899 125 (7%) 217 (183-2.67) <0.0001 1.80 (1.52-2.12) <0.0001 Any of the above 7368 1140 (15%) 1899 125 (7%) 217 (183-2.67) <0.0001 1.80 (1.52-2.12) <0.0001 Tachast tube vir face mask 5566 500 (9%) 820 53 (6%) 376 (287-4.99) 0.000 1.21 (0.92-1.58) 0.010 Tachast tube vir face mask 5566 500 (9%) 820 53 (6%) 376 (287-4.99) 0.000 1.21 (0.92-1.58) 0.000	* 1000 0000 0000	2235	465 (21%)	7021	801 (11%)	1-82 (1-64-2-02)	<0.0001	1:25 (1:14-1:36)	<0.000
Rhinitis in ±2 family members 349 96 (28%) 8336 998 (12%) 2 90(192-275) <00001 Ecsema in ±2 family members 710 75 (36%) 8507 1005 (12%) 3 02 (2 50-3 66) <00001 Both parents anothers 1075 259 (24%) 8222 1016 (12%) 1-95 (1-73-2 20) <00001 Any of the above 1808 427 (24%) 7489 846 (11%) 2 99 (188-2 32) <00001 1-55 (140-170) <00001 Any of the above 1808 427 (24%) 7489 846 (11%) 2 99 (188-2 32) <00001 1-55 (140-170) <00001 Array of the above 1808 427 (24%) 7489 846 (11%) 2 99 (188-2 32) <00001 1-55 (140-170) <00001 Array of the above 1808 750 (10%) 1-97 (178-218) <00001 Array of the above 1908 750 (10%) 1-97 (178-218) <00001 Change of ameethesis 3997 707 (20%) 5586 557 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Array of the above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Array of the above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Array of the above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Array of the above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis above 1909 (10%) 1-97 (178-218) <00001 Change of ameethesis (10%) 1-97 (178-218) <									
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Any of the above 1808 427 (24%) 7489 848 (11%) 2-09 (188-2-32) <0.0001 1.55 (1.40-170) <0.0001			, .		1005 (12%)	3 02 (2 50-3 66)	<0.0001		
Testified (1997) Alway managed by registra: 6219 (1015 (10%) 3078 (260 (8%) 1-93 (170-220) -00001 -170 (10%) 3078 (260 (8%) 1-93 (170-220) -00001 -170 (10%) 3586 (1		•	. ,		, ,	1:95 (1:73-2:20)	<0.0001		
All New y managed by registrac 6219 1015 (16%) 3078, 260 (8%) 1:03(1-70-2-20) -0.0001	0.01	1808 	427 (24%)	7489	848 (11%)	2 09 (1 88-2 32)	<0.0001	1:55 (1:40-1:70)	<0.00
######################################	e maria a la 1940 de Maio, a par separatro de medide	Cons.							
Charge of snaeethealologis: ourning 289 (56%) 9021 (122 (12%) 4-48 (398-619) <0.0001		(O)	the second section and the	4187505000000V744X	far Victing and Act	 M. Book of the barn Adversary 	100000000000000000000000000000000000000		or no cit <u>a</u> (p. Carana
always management. Any of the above 7398 1140 (15%) 1899 135 (7%) 217 (183-267) <0.0001 1-80 (152-212) <0.000 (150-207) <0.0001 11-00 (152-212) <0.000 (150-207) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-00 (152-212) <0.0001 11-0	(1.17) of (1.17) (1.17) (1.17) (1.17) (1.17) (1.17) (1.17) (1.17)	SHOW A THREE STATE OF	(S) Are guilling (S.C)	A0500000000000000000000000000000000000	" LANGE OF 1980 (54)	(3,570-4571)) - 15-15-15-15-15-15-15-15-15-15-15-15-15-1	$(\alpha_{\rm AM}, 0) = (7.7799)$		g Brua t i),
per of surgery Citolaryngoldogy 1189 276 (23%) 8108 999 (12%) 1-88 (1-67-2-12) <0.0001 1-10 (0.99-1-22) DOI heavy management divides used 24 (2.9%) 820 53 (6%) (1-44 (1-10-1-89) 0.009 1-21 (0.92-1-58) 0-17 Tactheal habb			iou (pow)	3	(122(12%)	448(398-505)	<0.0001		50 July 1970
pe of surgery Choloryngology 1189 276 (23%) 8108 999 (12%) 1.88 (1.67-2.12) <0.0001 1.10 (0.99-1.22) 0.00 reary management devices used 5596 500 (9%) 820 55 (6%) (1.44 (1.10-1.99) 0.0009 1.21 (0.92-1.58) 0.17 Tachest tube vir four mark 2891 702 (24%) 820 53 (6%) 576 (247-4.91) <0.0001 2.70 (247-3.53) <0.000	Any of the above	7368	1140 (15%)	1899	135 (7%)	217(163-257)	50,0001	1-80 (1-50-0-12)	en are
New y manisperies** (\$4*45- Used	ype of surgery		47.4.4.4.4.4.4.4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Constant at Man.	the official many attractor.		c. Talana få melæl selts om	. · · · · · · · · · · · · · · · · · · ·
Persy management divida lued		1189	276 (23%)	8108	999 (12%)	1:88 (1:67-2:12)	<0.0001	1:10 (0:99-1:22)	D OR
Tacthair tube vs faze, mask 2891 702 (24%) 820 53 (6%) 376 (247-491) <-0.0001 2.70 (247-313) <-0.0001	rway maringerhord dovice used		reponducijosekty	(2000) (2000) (2000) (2000) (2000) (2000) (2000)	engagyayah nahar	SWYW COLONY DOWN		general mederation	
Tractread tudo vs fozz mank 2891 702 (24%) 820 (53 (6%) 5376 (2474-51) - c0 0001 2-70 (247-513) <0.00	Contract to the contract and the contract to t	5586	520 (9%)	820	53(6K)	1:44(1:10-1:89)	0.009	1/21 (0 92-1/58)	0.17
stat televirian and televirian and it is a company that a second by the property of the company	Tractical tube vs face mask	2891	702 (24%)	820	53 (6%)	376(287-491)	<0.0001		<0.000
	a av meso (50) or number (5), 99						gymerka ()	ere deminist	indi. T

Helini Bulat tatamini awali	No infection in	ayir maanida ka jala ya	apartang rangsangga, apparan-	CANADA SA SECTION	Acid remainments		C0963 - W. W. Leverton	\$11.5. Harriston (19.20)	1975 S.C. HIC PROPERTY.	
lanamakan dibahasa			. RR (86% CI)	D Yakie	Infection	RR (35% CI)	p value 🔭 🧻	nfection	RR (95% CI) o v	alia
Helialia di di di 1979 Mari	plat 4 weeks	Infection	808 908 CHARL	CARCUTOWA	. 42 week u (1000)			- 4 weeks	998, 1175 militar, 1974.	9000000
- 10,1750 His (# 10,054 H # 1	(n=6142)	(n=1238)	\$4000000000000000000000000000000000000		strike (r=860)			ertior (n=1040)	(Confidential State of Time)	30.00
December 1	17.5 shoot askes a control 1787								nerving plantage and	````````````
Dronchoepawn	₽7 (2%)	45 (4%)	2 30 (1 63-3 26)	-0.0001	35 (4%)	255 (1/74-3/73)	<0.0001	6 (2%) (********	0-97 (0-58-1:65) 0-	922
Laryngospasm	158 (3%)	89 (7%)	2:80 (2:17-3:60)	<0.0001	90 (10%)	4 03 (3 14-5 16)	<0.0001		A 1 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	Tribu hay
3472 242 250) (ALL 100 (0 A.O.).	Marine Same	Contract Manager		WW. W	and the contraction of the same	WAY CONTRACTOR OF THE PARTY OF		14 (176)	052 (030–090) 0	019
Cough	363 (6%)	166 (13%)	2 27 (1.91-2.70	40 0001 ···	120 (14%)	234 (199-284)	<0.0001	4 (3%)	055 (039-078) 0	OD1
○ Detaturation <95%	490 (8%)	207 (17%)	2 10 (1 80-2 44)	< 0.0001	162 (19%)	2-34 (1-99-2-75)	<0.0001	57 (5%)	at the control of the cold	T (1)
Akway obstruction	Carte at atoms (1997)	TO SERVICE AND ADDRESS OF		1540 1 1 1	1.1 ·	and the second		1 1	0 69 (0 53-0 90) 0	0061
A service of the serv	174 (3%)	98(6%)	2 74 (2:15-3:49)	40.0001	46 (5%)	1-87 (1-36-2-57)	<0.0001	l5 (t%) ********	051 (030-088) 0	011±
∴ Any of the above	748 (12%)	309 (25%)	2-05 (1-82-2-31)	<0.0001	248 (29%)	234 (207-266)	<0.0001 8	33 (8%)	0.CC (0.C2 0.04)	
3 (1966) 96 (1976) 976 976 976 986 986 986	edas subspeciences	emanyata arysidian	0.000 (0.0	CONTRACTOR DATE	000000000000000000000000000000000000000	more service and the contract of the contract		en (o m)	O 66 (0 53-0 81)	0001
Data are number (%), PR-	relative risk, p valu	us that on no loc	and the second second	commettee by	- Angele and	hamal mathed on the	and Management	ana tenakan kata		menom i
*p=0.65 efter correction.	1040-22 after come	ction does 46 a	thar correction	in all all all a	- A - Company of the last		successor, nor all oth	or b among qual, exist	ection, one washippendix	p 7.
A. M	with the characters and		itaermatmare estima	we cheshiling	kowie stamonenen.		schilleningshiri	702 (MARCHES)	777735 VARNOVILA	090110001
Table & Risk of periops	entitos essociestos	-	de accordina en el					and the same		
NO. 10 10 10 10 10 10 10 10 10 10 10 10 10			to arrested to the	ment of abbar	PROPERTY DES	minicipal	00000000000000000000000000000000000000	errahatah terdisi	1960 attribution in the	(19) (n. 19)
			"						*	

stimulation of the upper airways by laryngeal mask alrway or tracheal tube. Use of airway management as an independent factor in the multivariate analysis drew already and the multivariate analysis

Bronchospasm		Layagospasin	All complication	Control of the second of the s
Protont ()	<2 weeks : 2-4 weeks : 2 / / /	Present	2-4 wools	-2 works 2-4 weeks
nose (0.001")	1/10 (0 60-2/03) 1 05 (0 50-2/22) 0 74) 0 90)	198 (148-269; 2-04 (145-287; -0 0001)	118 (0-65-1-94 1-49 (1-26-1-75; 0-67) +0-0001)	1-37 (1-13-1-66; 0-95 (0-72-1-27; 0-74)
nose 0.107) (2 36 (1·12-4·93; 0·75 (0·31-1·80; 0·023‡) 0·51)	4-40 (2-97-6-52; 6-62 (4-80-9-12; <0-0001) <0-0001)	0 09 (0 01-0 63; 3 12 (2 56-3 80; 0 015§) <0 0001)	3-37 (2-79-4-07; 0-23 (0-12-0-42; <0-0001)
0.071)	209 (115-381, 057 (018-178 0015§) 033)	216 (150-310; 214 (138-330; 40 0001) 0 001)	053(022-127; 171(141-207; 016) +00001)	186 (151-231) 031 (0.17-056) -0-0001) 00001)
<0.0001)	4 00 (2 55-6 28; 0 27 (0 07-1 10) <0 0001) 0 069)	3 89 (2 89-5-23; 6-53 (5-01-8-53; <0 0001) <0 0001)	0.08 (0.01-0.58; 3.05 (2.64-3.51; 0.012)¶ <0.0001)	3.42 (2.94-3.98; 0.45 (0.30-0.66; <0.0001) 0.0001)
1. A 17 10 11.15 = ==== 10 1 170 1	199 (076-527; 077 (025-234; 916) 065)	234 (114-480, 528 (347-600, 0020)) <00000)	057 (0 22-1 51; 2-89 (2 19-3 81; 926) -0 0001)	2 92 (2 28-3 81; 0 54 (0 32-0 89; -0 0001) 0 017**)
Data are relative risk compared with no a correction, use webspendix p 8,75–00	symptoms (95% Ct; p value). p values the	Af wire no konger eignafformt æfter oorrecti	on by the step-down Bonteroni method ar	indicated. For all other pivalues after

Table 5: Risk factors for perioperative bronchospeen, laryspospeen; or all complications according to timing of symptoms and respiratory adverse events.

difference between the laryngeal mask airway and the face mask with regard to the occurrence of perioperative bronchospasm, the use of laryngest mask strway was associated with a significantly higher risk for laryngospasm, but to a lesser extent than with the use of tracheal tube. This finding is in line with previous reports 2000 and can be attributed to the fact that both the laryngeal mask airway and the face mask do not stimulate the trachea." Taken together with the Increased risk of perioperative respiratory adverse events in children with a positive respiratory history or recent upper respiratory tract infection, the data from the present study suggest that children at increased risk of perioperative respiratory adverse events should be managed by an experienced paedlatric anaesthetist with induction and maintenance of anaesthesia done with intravenous propofol and the alrway maintained with a laryngeal mask alrway.

The incidence of perioperative laryngospasm and bronchospasm was significantly higher when the vocal cords were sprayed with lignocaine before trachest intubation. Although some investigators have reported that lidocaine can attenuate the neutrally-mediated reflexes that provoke bronchoconstriction, **-** others have reported a potential increase in airway tone after aerosol³⁴ and intravenous administration of lignocalne. Thus, despite the results of our study, further systematic investigations are needed to confirm the effect of lignocaine in the presence of bronchial hyper-reactivity.

Although there was a potential reporting bias in this large prospective cohort study, we were able to identify risk factors in children's medical history that were associated with an increased risk for perioperative respiratory adverse events (history of a recent cold, wheezing during exercise, wheezing more than three times in the past 12 months, nocturnal dry cough, eczema, or a family history of asthma, rhinitis, eczema, or exposure to tobacco smoke). These risk factors should be explored during the preoperative assessment in all children to establish the best anaesthesia care. Children at high risk of perioperative respiratory adverse events might benefit from anaesthesia management including a specialist paediatric anaesthetist, intravenous induction and maintenance with propofol, and avoidance of tracheal tube for airway management when possible.

Commissions was the principal Investigator, designed the study, did the Illerature search, collected, analysed, and interpreted the data, coordinated the team, and wrote the report. KE was the stadistician, analysed and interpreted the data, and wrote the report. NAC designed the study, collected and interpreted data, and wrote the report. CR did the literature search, collected data, and wrote the report. Clicollected data and wrote the report. PDS designed the study, interpreted the data, and wrote the report. WH designed the study, analysed and interp the data, dld the literature search, and wrote the report.

Conflicts of Interest We declare that we have no conflicts of interest

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