Euroanaesthesia
THE EUROPEAN ANAESTHESIOLOGY CONGRESS
COPENHAGEN 02-04 JUNE 2018

Small Airways – Big Problems??

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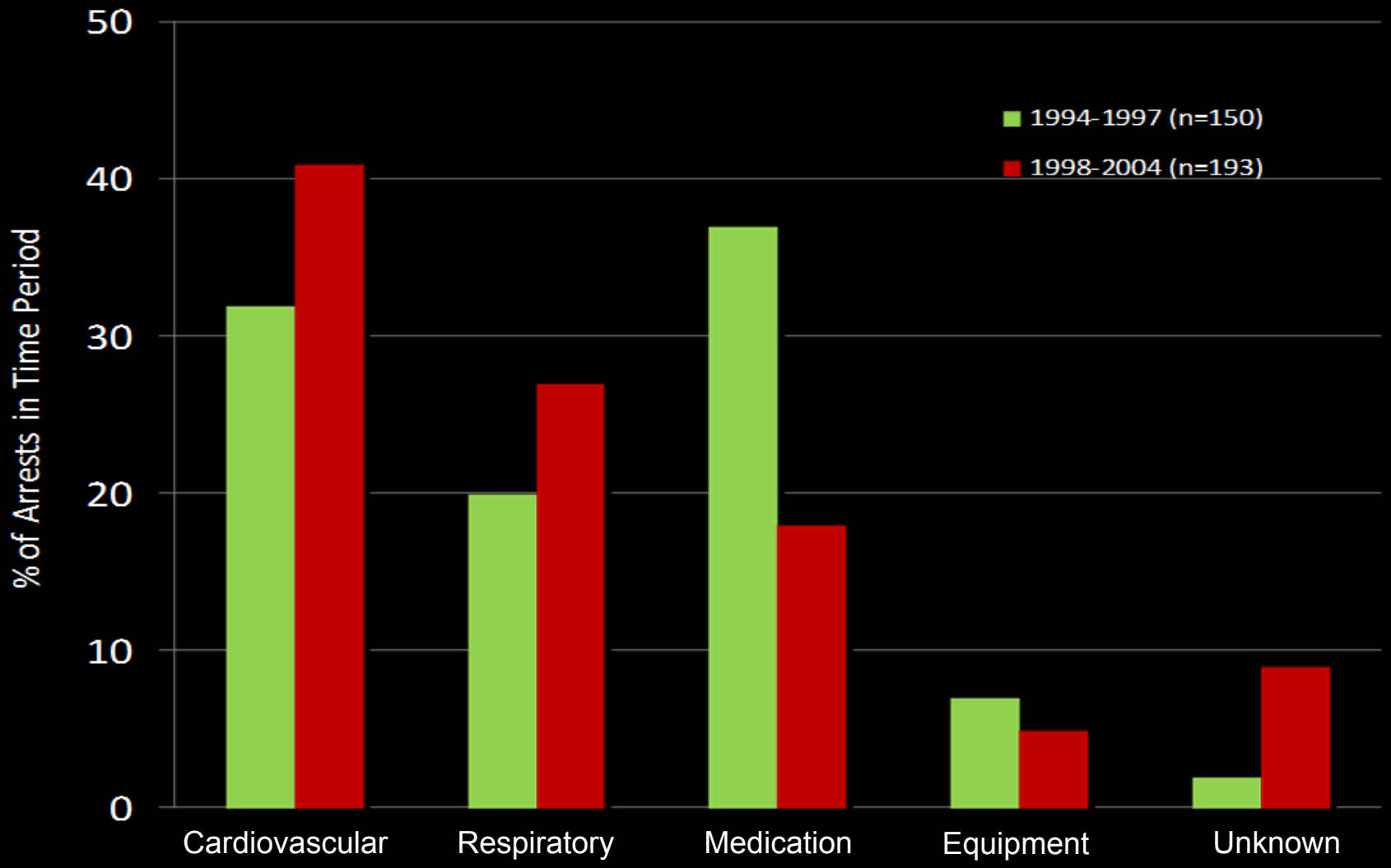
Conflict of interest

SMALL

•Cohen, M. M., Cameron, C. B., and Duncan, P. G. (1990) Pediatric anesthesia morbidity and mortality in the perioperative period. Anesth Analg 70: 160-167.
•Gobbo, B. L., Braz, J. R., Modolo, N. S., do, N. P., Brushi, B. A., and Raquel, d. C. (2006) Perioperative cardiac arrest and its mortality in children. A 9-year survey in a Brazilian tertiary teaching hospital. Paediatr Anaesth 16: 860-866.
•Ahmed A, Ali M, Khan EA, Khan MU. An audit of perioperative cardiac arrests in a Southeast Asian university teaching hospital over 15 years.Anaesth Intensive Care. 2008 Sep;36(5):710-6.
•Bunchungmongkol N, Punjasawadwong Y, Chumpathong S, Somboonviboon W, Suraseranivongse S, Vasinanukorn M, Srisawasdi S, Thienthong S, Pranootnarabhal T. Anesthesia-related cardiac arrest in children: the Thai Anesthesia Incidents Study (THAI Study). J Med Assoc Thai. 2009 Apr;92(4):523-30.
•NCEPOD
•NAP4
•LEANDRO GOBBO BRAZ , JOSE REINALDO, CERQUEIRA BRAZ NORMA SUELI PINHEIRO, DOLO MD PAULO DO NASCIMENTO JR,BRUNO AUGUSTO MOURA BRUSHI, IDIA RAQUEL DE CARVALHO. Perioperative cardiac arrest and its mortalityin children. A 9-year survey in a Brazilian ertiary teaching hospital Pediatric Anesthesia 2006 16: 860–866
•Chandra Ramamoorthy,, Charles M. Haberkern, Sanjay M. Bhananker,Karen B. Domino, Karen L. Posner, John S. Campos and Jeffrey P. Morray, Anesthesia-Related Cardiac Arrest in Children with Heart Disease: Data from the Pediatric Perioperative Cardiac Arrest (POCA) Registry Anesth Analg 2010;110:1376–82
•Nathalia Jimenez, MD, MPH
•Karen L. Posner,Frederick W. Cheney, Robert A. Caplan, Lorri A. Lee, Karen B. Domino, An Update on Pediatric Anesthesia Liability: A Closed Claims Analysis An Update on Pediatric Anesthesia Liability: A Closed Claims Analysis ANESTH ANALG 2007;104:147–53
•Keenan, R. L. and Boyan, C. (1985) Cardiac arrest due to anesthesia. A study of incidence and causes. JAMA 253: 2373-2377.
•Morita, K., Kawashima, Y., Irita, K., Iwao, Y., Seo, N., and Tsuzaki, K. (2002) [Perioperative mortality and morbidity in the year 2000 in 520 certified training hospitals of Japanese Society of Anesthesiologists: with a special reference to age--report of Japanese Society of Anesthesiologists Committee on Operating Room Safety]. Masui 51: 1285-1296.
•Murat, I., Constant, I., and Maud'huy, H. (2004) Perioperative anaesthetic morbidity in children: a database of 24,165 anaesthetics over a 30-month period. Paediatr Anaesth 14: 158-166.
•Olsson, G. L. and Hallen, B. (1988) Cardiac arrest during anaesthesia. A computer-aided study in 250,543 anaesthetics. Acta Anaesthesiol Scand 32: 653-664.
•Tiret, L., Nivoche, Y., Hatton, F., Desmonts, J. M., and Vourc'h, G. (1988) Complications related to anaesthesia in infants and children. A prospective survey of 40240 anaesthetics. Br J Anaesth 61: 263-269.
•Morgan, C., Webb, R., Cockings, J., and Williamson, J. (1993) Cardiac arrest. An analysis of 2000 incident reports. Anaesth Intensive Care 21: 626-637.

Significant cause for peri-operative cardiac arrests



Anesth Analg 2007; 376:773

Airway management complications in children with difficult tracheal intubation from the Pediatric Difficult Intubation (PeDI) registry: a prospective cohort analysis

Lancet Respir Med 2016; 4: 37–48

	Anticipated difficult airway (n=821)	Unanticipated difficult airway (n=197)	Total (n=1018)
Success*	810 (99%)	188 (95%)	998 (98%)
Surgical or failed airway*	10 (1%)	9 (5%)	19 (2%)
Any complications	157 (19%)	47 (24%)	204 (20%)
Severe complications†	19 (2%)	11 (6%)	30 (3%)
Cardiac arrest	10 (1%)	5 (3%)	15 (1%)
Severe airway trauma	8 (1%)	6 (3%)	14 (1%)
Death	3 (<1%)	2 (1%)	5 (<1%)
Aspiration	1 (<1%)	0	1 (<1%)
Pneumothorax	1 (<1%)	0	1 (<1%)
Non-severe complications†	148 (18%)	44 (22%)	192 (19%)
Hypoxaemia	65 (8%)	29 (15%)	94 (9%)
Minor airway trauma	36 (4%)	8 (4%)	44 (4%)
Oesophageal intubation with immediate recognition	21 (3%)	11 (6%)	32 (3%)
Laryngospasm	24 (3%)	8 (4%)	32 (3%)
Epistaxis	12 (1%)	2 (1%)	14 (1%)
Bronchospasm	7 (1%)	5 (3%)	12 (1%)
Pharyngeal bleeding	10 (1%)	2 (1%)	12 (1%)
Arrhythmia	3 (<1%)	1 (1%)	4 (<1%)
Emesis	4 (<1%)	0	4 (<1%)

European Society of Anaesthesiology ESA

ESA Clinical Trial Network

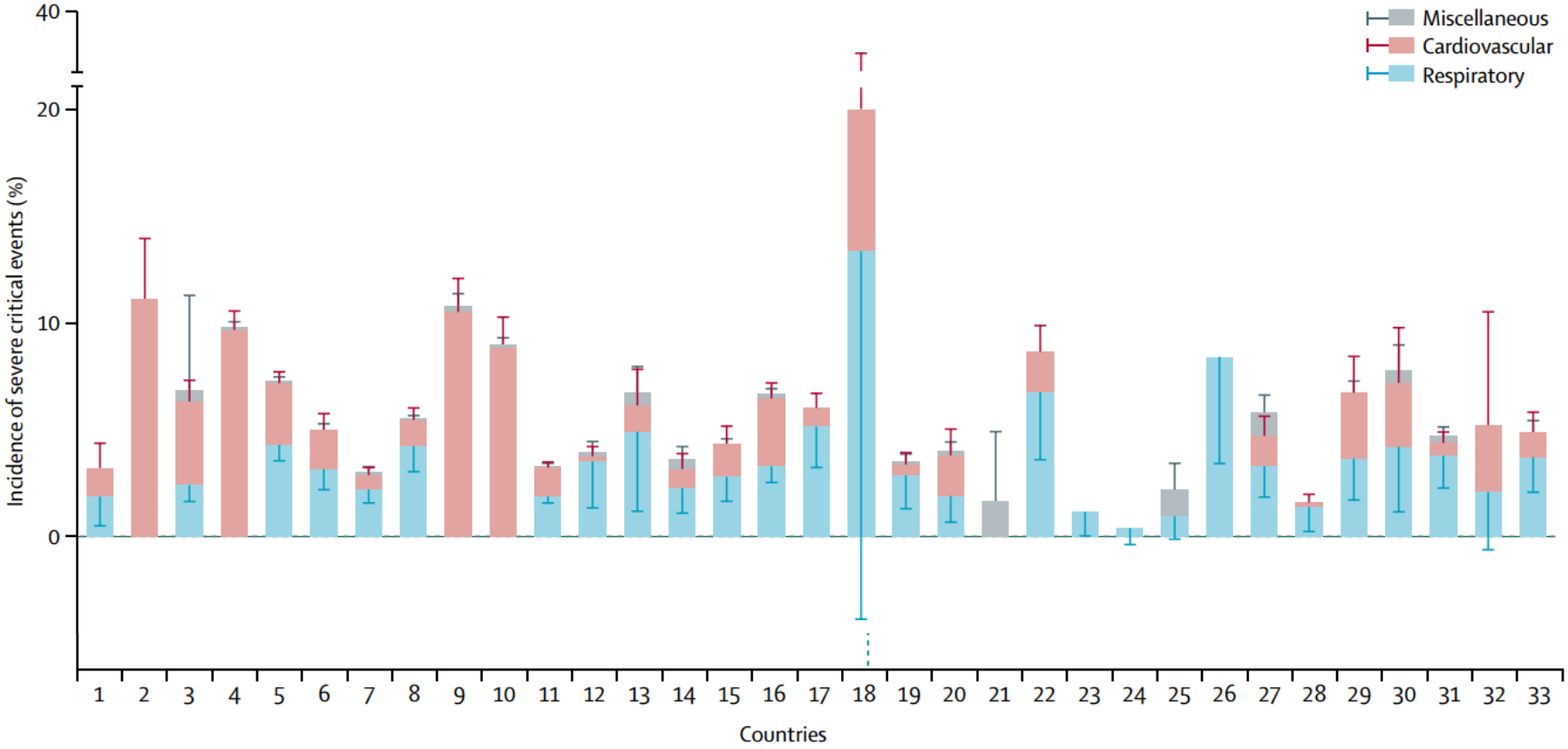
Anaesthesia Practice In Children Observational Trial

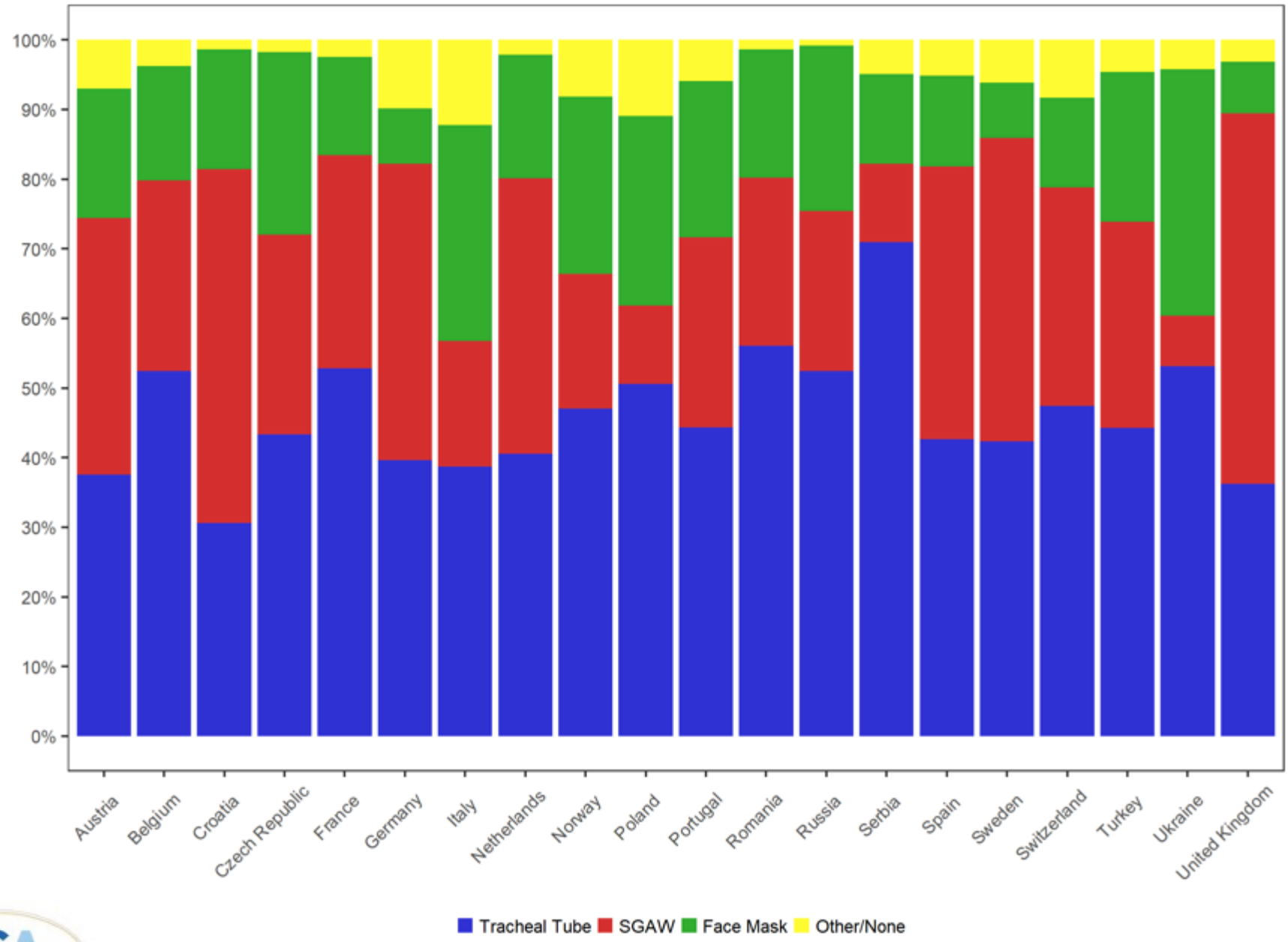
Incidence of severe critical events in paediatric anaesthesia (APRICOT): a prospective multicentre observational study in 261 hospitals in Europe

*Walid Habre, Nicola Disma, Katalin Virag, Karin Becke, Tom G Hansen, Martin Jöhr, Brigitte Leva, Neil S Morton, Petronella M Vermeulen, Marzena Zielinska, Krisztina Boda, Francis Veyckemans, for the APRICOT Group of the European Society of Anaesthesiology Clinical Trial Network**

Lancet Respir Med. 2017; 5:412-425.

Variation of critical incidences across Europe





ESA Clinical Trial Network

Br J Anaesth doi: 10.1016/j.bja2018.04.013

Endotracheal intubation in the pediatric emergency department

Elliot Long[1,2,3], Stefan Sabato[2,4] & Franz E. Babl[1,2,3]

1 Department of Emergency Medicine, Royal Children's Hospital, Parkville, Vic., Australia

Adverse events in 39% of all patients

Table 3 Success rate by intubator specialty and seniority for each intubation attempt *n* (%)[a]

	Success rate for intubation attempt no. 1	Success rate for intubation attempt no. 2	Success rate for intubation attempt no. 3
ED Consultant	12/17 (71)	5/6 (83)	2/2 (100)
ED Fellow	4/6 (67)	1/1 (100)	0
ED Registrar	18/22 (82)	1/2 (50)	0
ICU Registrar	17/22 (77)	1/4 (25)	2/2 (100)
Anesthetic Consultant	1/1 (100)	1/1 (100)	0
Anesthetic Registrar	2/3 (67)	1/2 (50)	1/1 (100)

Table 5 Adverse events during tracheal intubation

Adverse event	*n* (%)
Hypotension	15 (21)
Desaturation	10 (14)
Bradycardia	5 (7)
Second dose paralytic	3 (4)
Esophageal intubation	1 (1)
Endobronchial intubation	1 (1)
Equipment failure	1 (1)
Medication error	1 (1)
Vomit with aspiration	1 (1)

Cardiac Arrests Associated With Tracheal Intubations in PICUs: A Multicenter Cohort Study*

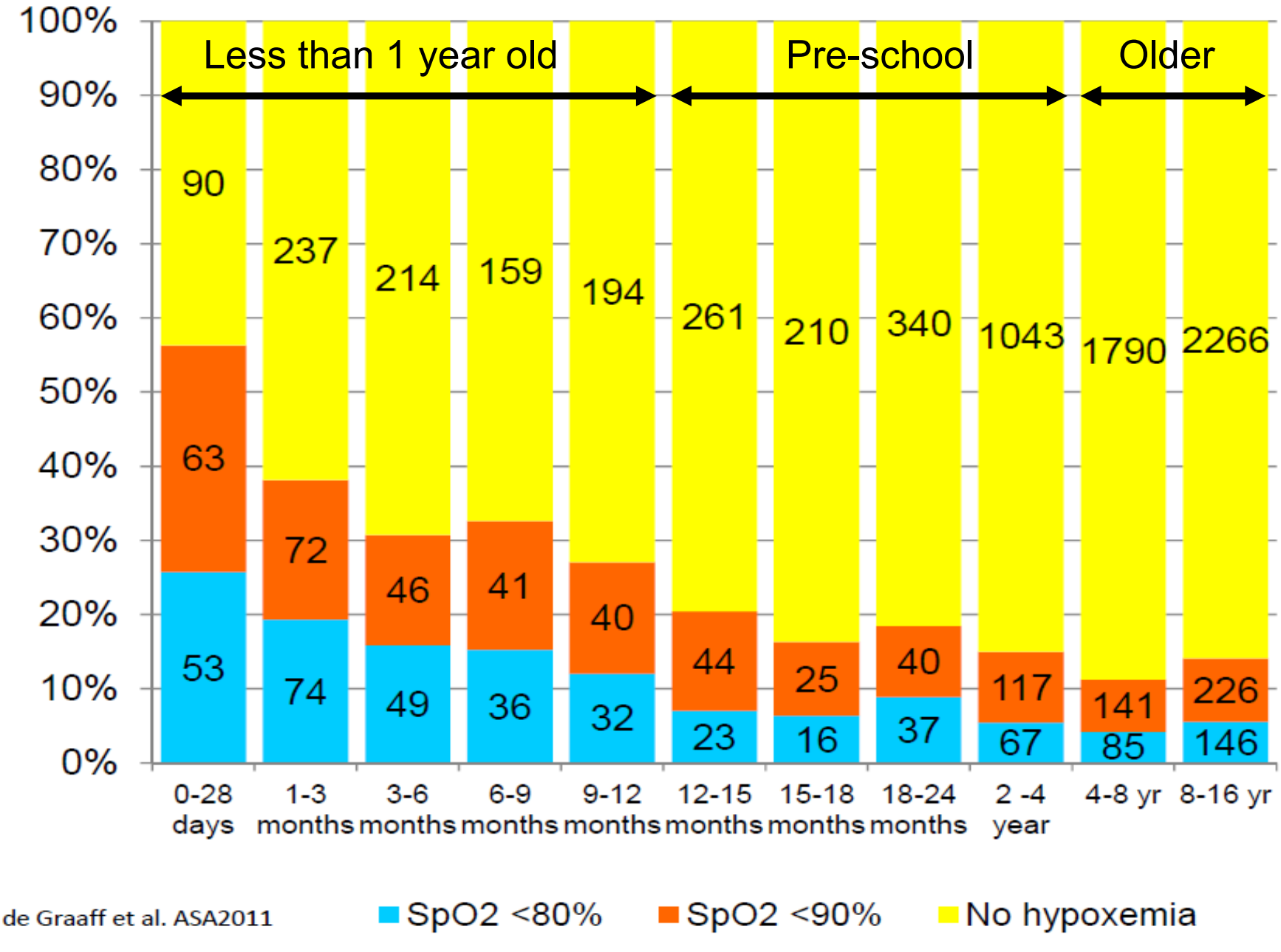
Yuko Shiima, MD, MSCE[1]; Robert A. Berg, MD[2]; Hillary R. Bogner, MD, MSCE[3]; Knashawn H. Morales, ScD[4]; Vinay M. Nadkarni, MD, MS[1,2]; Akira Nishisaki, MD, MSCE[1,2]; for the National Emergency Airway Registry for Children and the Pediatric Acute Lung Injury and Sepsis Investigators

Crit Care Med 2016; 44:1675–1682

Factors	Tracheal Intubation Without Cardiac Arrest, *n* (%) (*n* = 5,145)	Tracheal Intubation With Cardiac Arrest, *n* (%) (*n* = 87)	*p*
Shock	550 (10.7)	36 (41.4)	< 0.001
Oxygen failure	1,938 (37.7)	62 (71.3)	< 0.001
Provider factor			
Resident	1,422 (27.6)	12 (13.8)	0.013
Use of neuromuscular blockade	4,532 (88.1)	68 (78.2)	0.003

BIG

Younger children are high risk



JC de Graaff et al. ASA2011

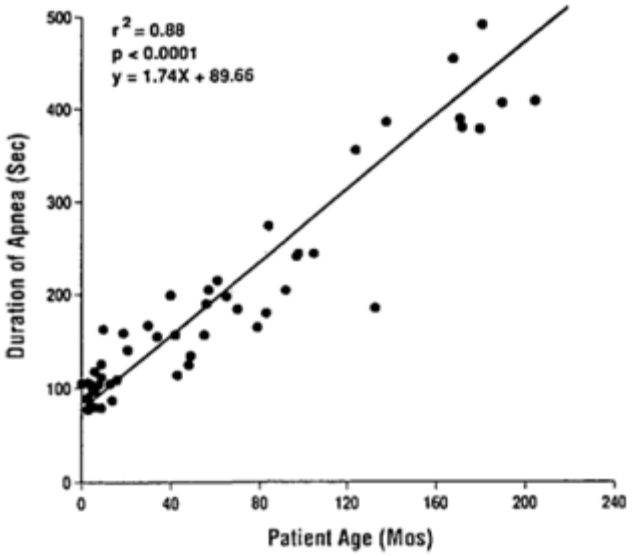
Frequent Problems

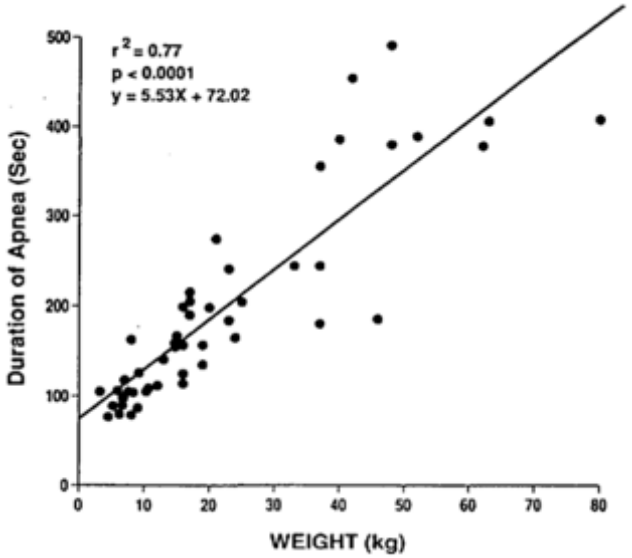
Perioperative anaesthetic morbidity in children: a database of 24 165 anaesthetics over a 30-month period

Pediatric Anesthesia 2004 **14**: 158–166

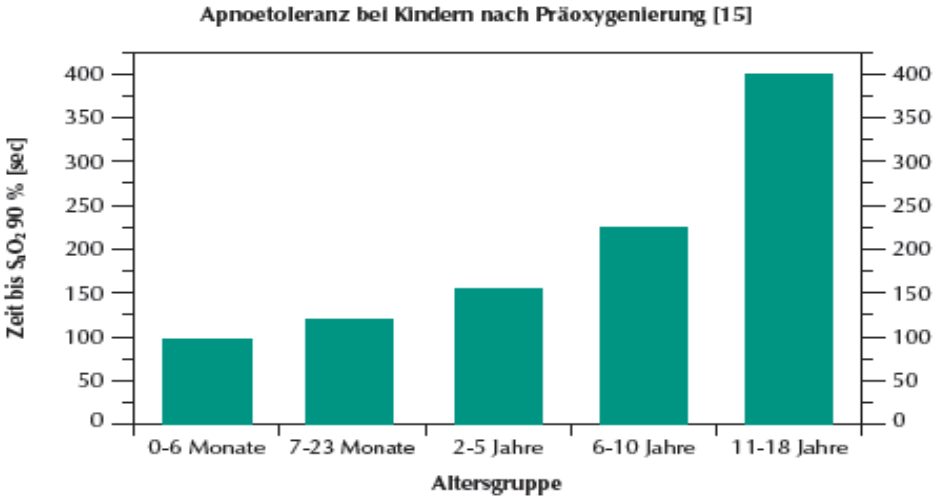
	Intraoperative			*PACU*		
Respiratory event	*0–1 year*	*1–7 years*	*8–16 years*	*0–1 years*	*1–7 years*	*8–16 years*
No. of anaesthetics	3681	12 495	6867	3681	12 495	6867
Bronchospasm	19	25	4	4	11	5
Hypercarbia	8	10	1	5	5	8
Hypoxaemia	56	90	24	21	34	15
Aspiration	2	4	4	1	5	3
Unanticipated difficult intubation	9	7	6	–	–	–
Oesophageal intubation	3	2	1	–	–	–
Endobronchial intubation	6	3	1	3	5	7
Laryngospasm	17	31	9	1	6	4
Total	133	191	59	54	113	75
Rate per 1000 anaesthetics	36.1	15.3	8.6	14.7	9.0	10.9

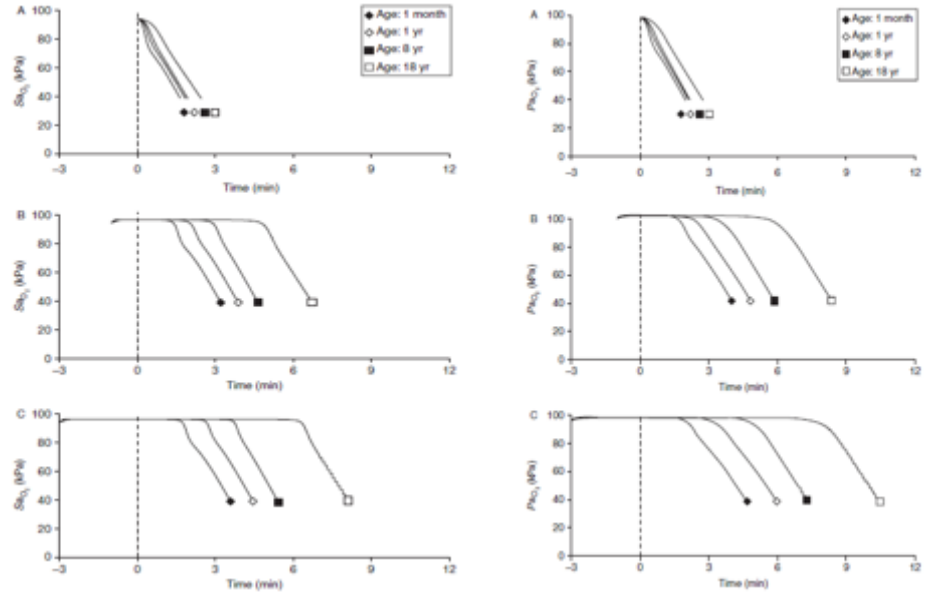
Wake up
is not an option





Can J Anaesth 1994; 41:771





Br J Anaesth 2006; 97:564

PRINCIPLES

Prevent problems

Prevention of difficulties

Pre-operative assessment and recognition of existing airway problems

Avoidance of occasional paediatric practice

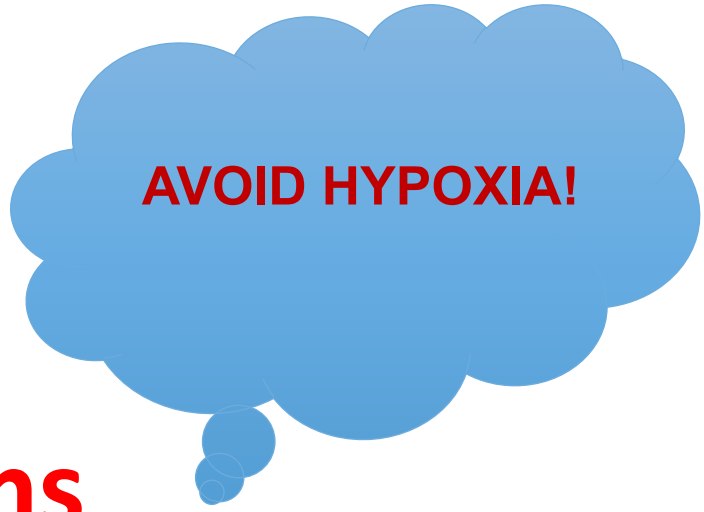
Continuing medical education and training

Trained assistants

Suitable paediatric equipment

Optimal preparation of the child

Oxygenation and Ventilation safes lives



Clear separation of problems

Oxygenation & ventilation (face mask)

Tracheal intubation

Airway management complications in children with difficult tracheal intubation from the Pediatric Difficult Intubation (PeDI) registry: a prospective cohort analysis

Lancet Respir Med 2016; 4: 37–48

	Anticipated difficult airway (n=821)			Unanticipated difficult airway (n=197)			Total (n=1018)		
	No complications (n=664)	Complications (n=157)	p value	No complications (n=150)	Complications (n=47)	p value	No complications (n=814)	Complications (n=204)	p value
Mask ventilation			<0·0001			0·03			<0·0001
Easy mask ventilation	430 (65%)	66 (42%)	..	118 (79%)	30 (64%)	..	548 (67%)	96 (47%)	..
Airway adjunct needed	119 (18%)	39 (25%)	..	24 (16%)	11 (23%)	..	143 (18%)	50 (25%)	..
Difficult mask ventilation	39 (6%)	28 (18%)	..	4 (3%)	6 (13%)	..	43 (5%)	34 (17%)	..
Impossible for mask ventilation	0 (0%)	5 (3%)	..	1 (<1%)	0 (0%)	..	1 (<1%)	5 (2%)	..
Not attempted	76 (11%)	19 (12%)		3 (2%)	0 (0%)		79 (10%)	19 (9%)	

Big problem, small incidence, and large registry datasets

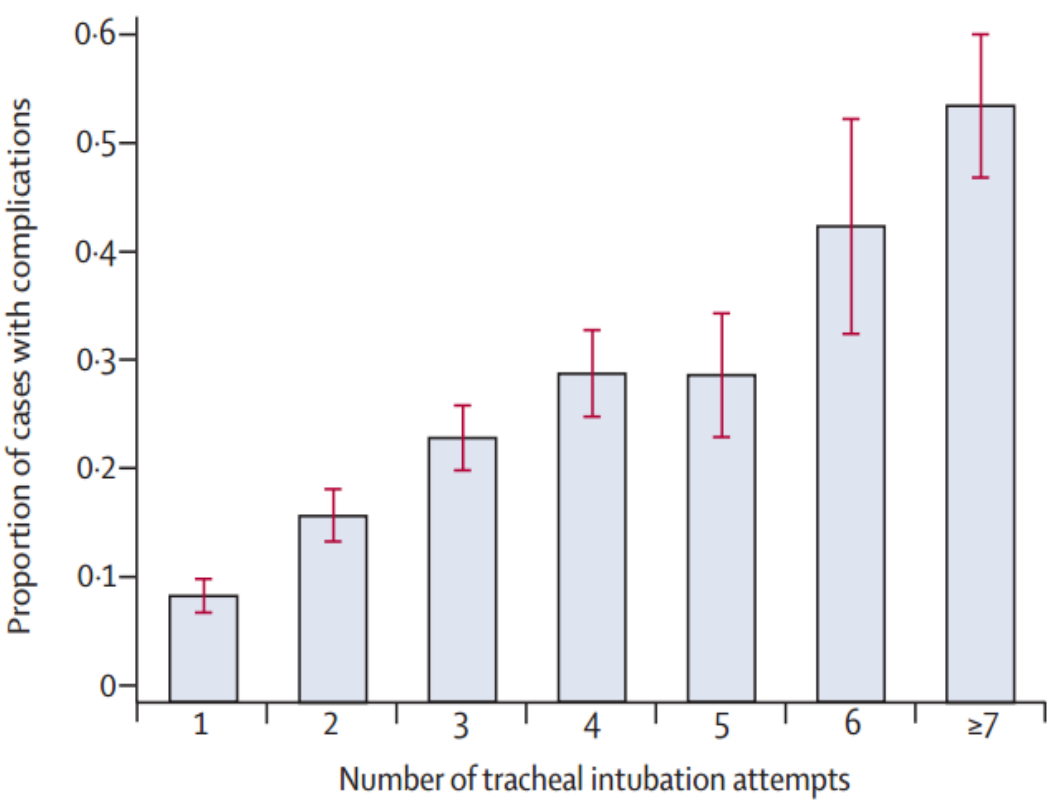
Britta S von Ungern-Sternberg, Adrian Regli www.thelancet.com/respiratory **Vol 4 January 2016**

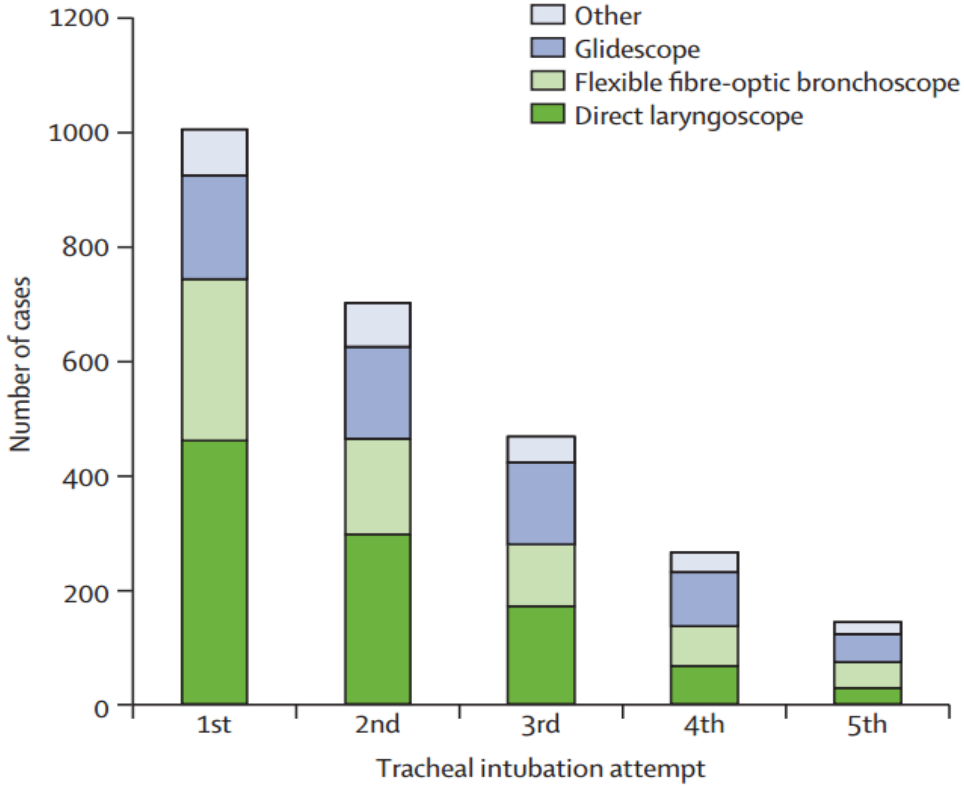
Impossible face mask ventilation

- Extremely rare and predicted in 5/6 patients
- Improvement by muscle relaxation 4/6, SAD 2/6, Tracheal intubation successful in all

Airway management complications in children with difficult tracheal intubation from the Pediatric Difficult Intubation (PeDI) registry: a prospective cohort analysis

Lancet Respir Med 2016; 4: 37–48





British Journal of Anaesthesia, ■ (■): 1–10 (2018)

doi: 10.1016/j.bja.2018.04.013

CLINICAL INVESTIGATION

Airway management in paediatric anaesthesia in Europe—insights from APRICOT (Anaesthesia Practice In Children Observational Trial): a prospective multicentre observational study in 261 hospitals in Europe

SGA insertion

successful within 2 attempts in 99.5%

(n=10,915)

Editor's key points

- Critical respiratory events are common in children in the perianaesthetic period, but the incidence and potential consequences of difficult airway management are not clear.
- Analysis of >31 000 anaesthetic procedures provided the incidence of difficult airway management.
- Multiple airway device insertion attempts and pre-existing respiratory risk factors increase the likelihood of critical respiratory events in children.

Recognize and treat airway obstructions

COMMON TO ALL AIRWAY PROBLEMS

Anatomical airway obstructions

Functional airway obstructions

Oxygenation & Ventilation Problems

Anatomical Airway Obstructions

Causes

- Inadequate head position
- Poor facemask technique
- Large adenoids/ tonsils/ obesity
- Secretions

Functional Airway Obstructions

Causes

- Inadequate anaesthesia
- Laryngospasm
- Muscle rigidity
- Bronchospasm

Anatomical Airway Obstructions

Causes

- Inadequate head position
- Poor facemask technique
- Large adenoids/ tonsils/ obesity
- Secretions

Treatment

- Repositioning/ re-opening/ Guedel
- Two-hand/ two person technique
- Suction

YOU

Functional Airway Obstructions

Causes

- Inadequate anaesthesia
- Laryngospasm
- Muscle rigidity
- Bronchospasm

Treatment

- Deepen anaesthesia
- Muscle relaxation
- Epinephrine

DRUGS

Functional Airway Obstructions

Causes

- Inadequate anaesthesia
- Laryngospasm
- Muscle rigidity
- Bronchospasm

Treatment

- Deepen anaesthesia
- Muscle relaxation
- Epinephrine

'Even if it was not part of the initial airway management strategy, if CICV occurs and waking the patient up is not an option, a muscle relaxant should be given before determining the need to proceed to a surgical airway.'

Functional Airway Obstructions

Causes

- Inadequate anaesthesia
- Laryngospasm
- Muscle rigidity
- Bronchospasm

Treatment

- Deepen anaesthesia
- Muscle relaxation
- Epinephrine

'CANNOT VENTILATE –

DEEPEN ANAESTHESIA

PARALYZE

(EPINEPHRINIZE)

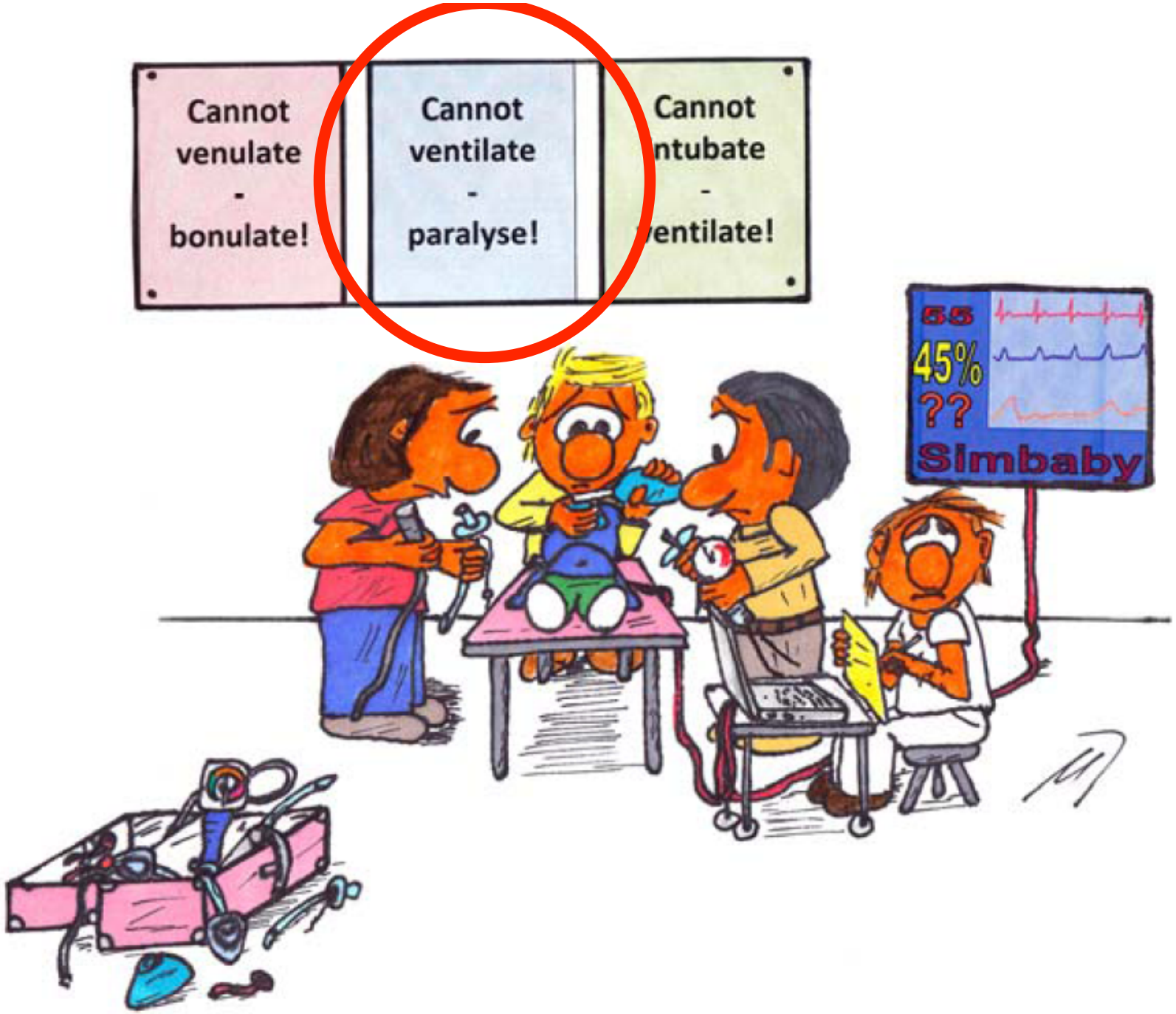
(in otherwise healthy children)

Anaesthesia, 2007, **62**, pages 757–759

Which port in a storm? Use of suxamethonium without intravenous access for severe laryngospasm

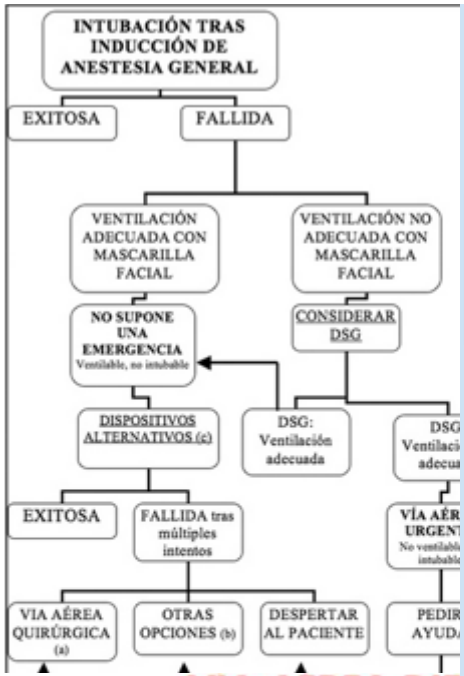
Pediatric Anesthesia **22** (2012) 1147–1149

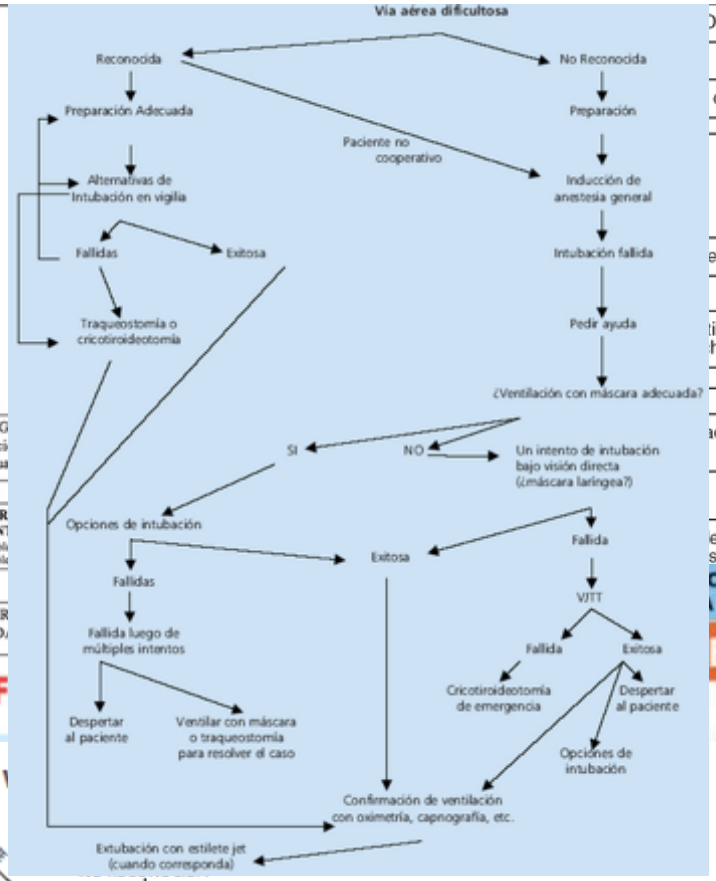
Cannot ventilate – paralyze!

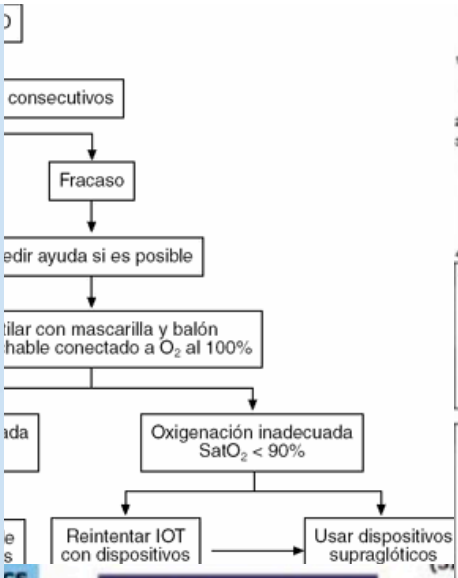

Cannot venulate - bonulate!
Cannot ventilate - paralyse!
Cannot ntubate - ventilate!
55
45%
??
Simbaby

SOLUTIONS

Simplicity safes lives

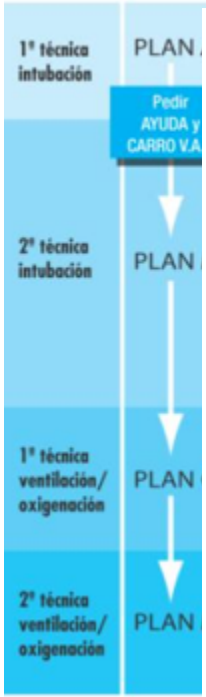

INTUBACIÓN TRAS INDUCCIÓN DE ANESTESIA GENERAL
EXITOSA
FALLIDA
VENTILACIÓN ADECUADA CON MASCARILLA FACIAL
VENTILACIÓN NO ADECUADA CON MASCARILLA FACIAL
NO SUPONE UNA EMERGENCIA
Ventilable, no intubable
CONSIDERAR DSG
DISPOSITIVOS ALTERNATIVOS (c)
DSG: Ventilación adecuada
EXITOSA
FALLIDA tras múltiples intentos
VIA AÉREA QUIRÚRGICA (a)
OTRAS OPCIONES (b)
DESPERTAR AL PACIENTE
VIA AÉREA DIF

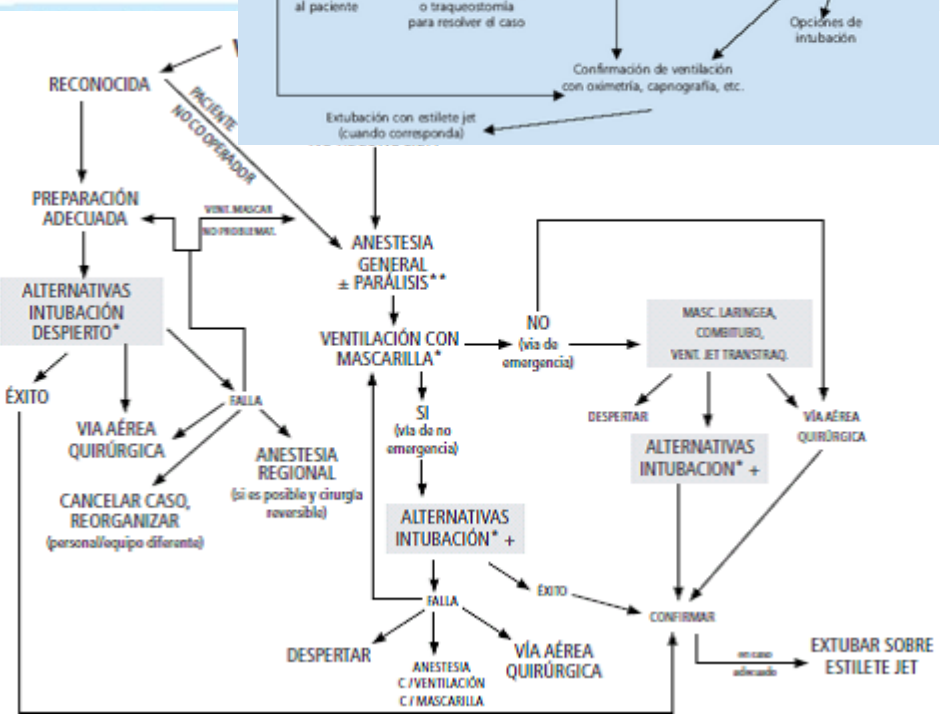

Vía aérea dificultosa
Reconocida
No Reconocida
Preparación Adecuada
Preparación
Paciente no cooperativo
Alternativas de Intubación en vigilia
Inducción de anestesia general
Fallidas
Exitosa
Intubación fallida
Traqueostomía o cricotiroideotomía
Pedir ayuda
¿Ventilación con máscara adecuada?
SI
NO
Un intento de intubación bajo visión directa (¿máscara laríngea?)
Opciones de intubación
Exitosa
Fallida
Fallidas
VJTT
Fallida luego de múltiples intentos
Fallida
Exitosa
Cricotiroideotomía de emergencia
Despertar al paciente
Despertar al paciente
Ventilar con máscara o traqueostomía para resolver el caso
Opciones de intubación
Confirmación de ventilación con oximetría, capnografía, etc.
Extubación con estilete jet (cuando corresponda)

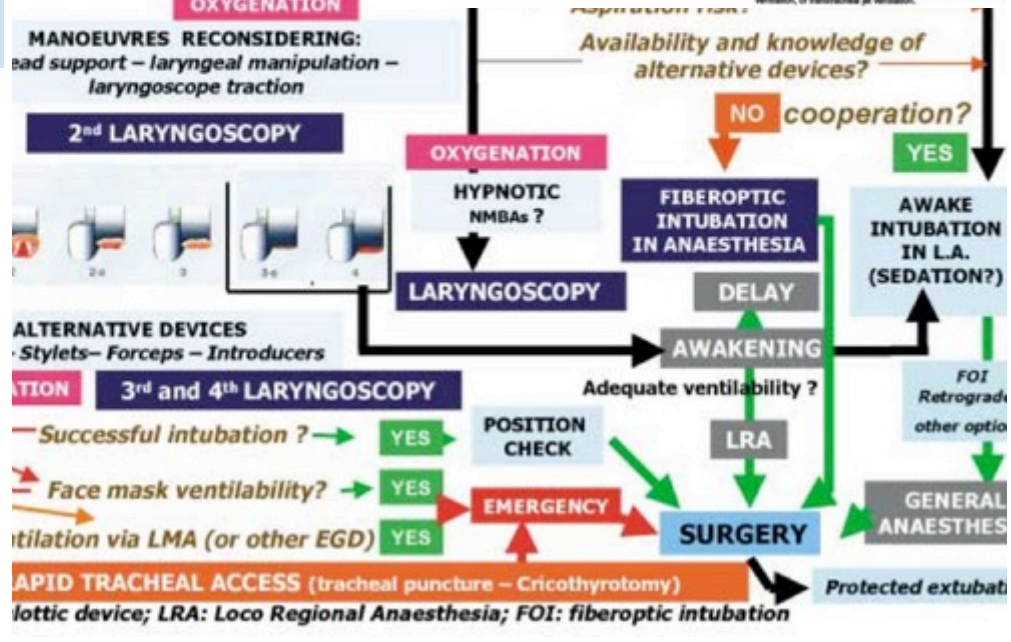

consecutivos
Fracaso
edir ayuda si es posible
ilar con mascarilla y balón
hable conectado a O2 al 100%
Oxigenación inadecuada
SatO2 < 90%
Reintentar IOT con dispositivos
Usar dispositivos supraglóticos
1st LARYNGOSCOPY

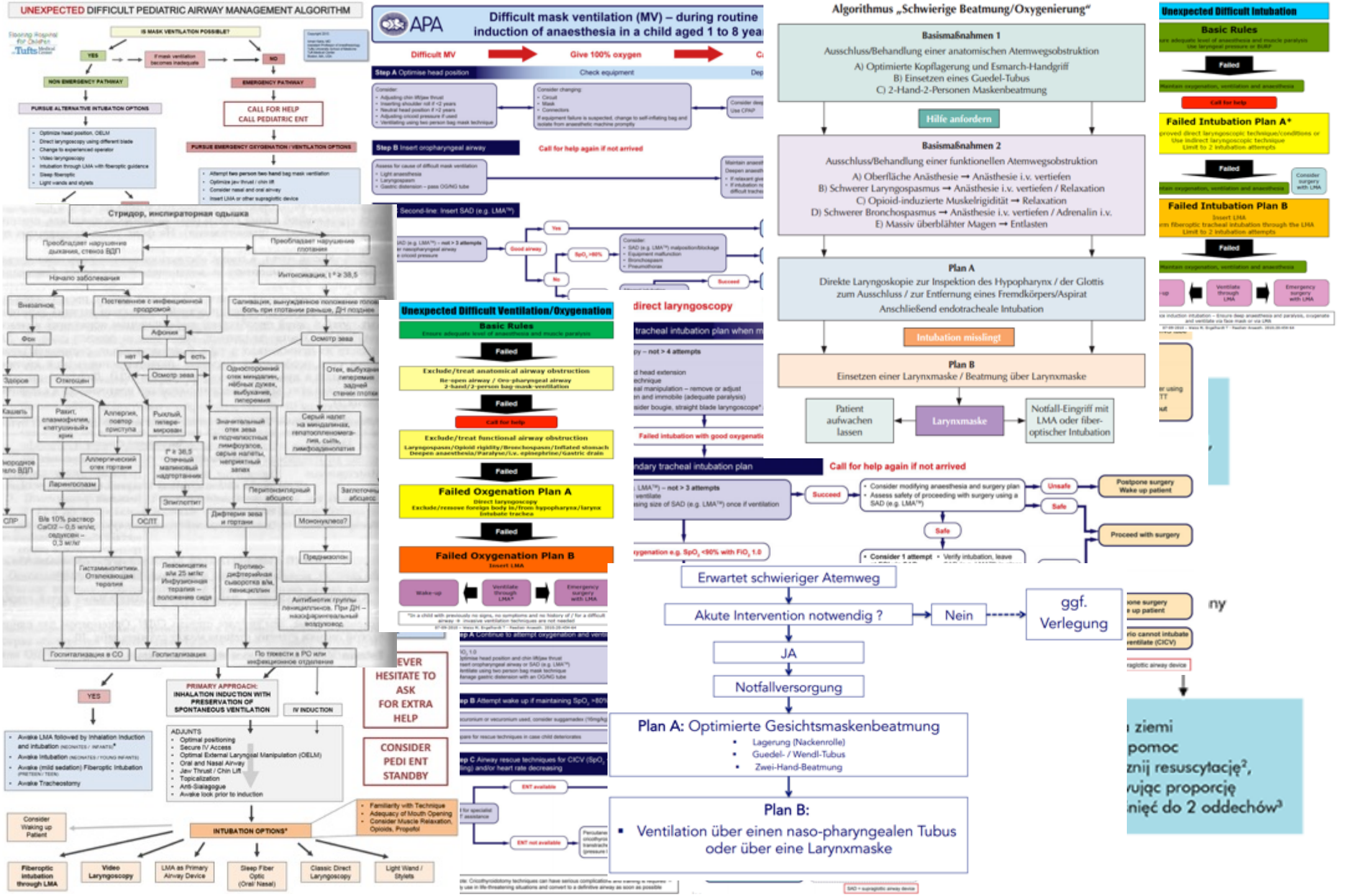

DIFFICULT AIRWAY ALGORITHM
1. Assess the likelihood and clinical impact of basic management problems:
A. Difficult Ventilation
B. Difficult Intubation
C. Difficulty with Patient Cooperation or Consent
D. Difficult Tracheostomy
2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway manageme
3. Consider the relative merits and feasibility of basic management choices:
A. Awake Intubation vs Intubation Attempts After Induction of General Anesthesia
B. Non-Invasive Technique for Initial Approach to Intubation vs Invasive Technique for Initial Approach to Intubation
C. Preservation of Spontaneous Ventilation vs Ablation of Spontaneous Ventilation
4. Develop primary and alternative strategies:
AWAKE INTUBATION
INTUBATION ATTEMPTS AFTER INDUCTION OF GENERAL ANESTHESIA
FACE MASK VENTILATION ADEQUATE
FACE MASK VENTILATION NOT ADEQUATE
CONSIDER / ATTEMPT LMA
LMA ADEQUATE*
LMA NOT ADEQUATE OR NOT FEASIBLE
NON-EMERGENCY PATHWAY
EMERGENCY PATHWAY
IF BOTH FACE MASK AND LMA VENTILATION BECOME INADEQUATE


EDICTED DIFFICULTY
CALL FOR HELP
Face mask
entilability?
YES
OXYGENATION
MANOEUVRES RECONSIDERING:
ead support – laryngeal manipulation –
laryngoscope traction
2nd LARYNGOSCOPY


1ª técnica intubación
PLAN
Pedir AYUDA y CARRO V.A
2ª técnica intubación
PLAN
1ª técnica ventilación/ oxigenación
PLAN
2ª técnica ventilación/ oxigenación
PLAN


RECONOCIDA
PACIENTE NO COLABORADOR
PREPARACIÓN ADECUADA
VENT. MASCAR NO PROBLEMAT.
ANESTESIA GENERAL ± PARÁLISIS**
ALTERNATIVAS INTUBACIÓN DESPIERTO*
VENTILACIÓN CON MASCARILLA*
NO (vía de emergencia)
MASC. LARINGEA, COMBITUBO, VENT. JET TRANSTRAQ.
ÉXITO
FALLA
VIA AÉREA QUIRÚRGICA
ANESTESIA REGIONAL (si es posible y cirugía reversible)
CANCELAR CASO, REORGANIZAR (personal/equipo diferente)
SI (vía de no emergencia)
DESPERTAR
ALTERNATIVAS INTUBACION* +
VÍA AÉREA QUIRÚRGICA
ALTERNATIVAS INTUBACIÓN* +
FALLA
ÉXITO
CONFIRMAR
DESPERTAR
ANESTESIA C./VENTILACIÓN C./MASCARILLA
VÍA AÉREA QUIRÚRGICA
EXTUBAR SOBRE ESTILETE JET


Availability and knowledge of alternative devices?
NO cooperation?
YES
OXYGENATION
HYPNOTIC
NMBAs ?
FIBEROPTIC INTUBATION IN ANAESTHESIA
AWAKE INTUBATION IN L.A. (SEDATION?)
LARYNGOSCOPY
DELAY
ALTERNATIVE DEVICES
Stylets– Forceps – Introducers
AWAKENING
3rd and 4th LARYNGOSCOPY
Adequate ventilability ?
Successful intubation ?
YES
POSITION CHECK
LRA
Face mask ventilability?
YES
EMERGENCY
SURGERY
tilation via LMA (or other EGD)
YES
APID TRACHEAL ACCESS (tracheal puncture – Cricothyrotomy)
Protected extubati
lottic device; LRA: Loco Regional Anaesthesia; FOI: fiberoptic intubation


UNEXPECTED DIFFICULT PEDIATRIC AIRWAY MANAGEMENT ALGORITHM
IS MASK VENTILATION POSSIBLE?
YES
NO
NON EMERGENCY PATHWAY
EMERGENCY PATHWAY
PURSUE ALTERNATIVE INTUBATION OPTIONS
CALL FOR HELP
CALL PEDIATRIC ENT
PURSUE EMERGENCY OXYGENATION / VENTILATION OPTIONS
Стридор, инспираторная одышка
Преобладает нарушение дыхания, стеноз ВДП
Преобладает нарушение глотания
Начало заболевания
Интоксикация, t ° ≥ 38,5
Внезапное
Постепенное с инфекционной продромой
Саливация, вынужденное положение головы, боль при глотании раньше, ДН позднее
Фон
Афония
Осмотр зева
Здоров
Отягощен
Кашель
Рахит, спазмофилия, «ларингиальный крик»
Аллергия, повтор приступа
Рыхлый, гипере-мирован
Аллергический отек гортани
Ларингоспазм
Эпиглоттит
ОСЛТ
Дифтерия зева и гортани
Перитонзиллярный абсцесс
Заглоточный абсцесс
Мононуклеоз?
Предникалон
Гастаминолитики. Отвлекающая терапия
Левомицетин в/в 25 мг/кг Инфузионная терапия – положение сидя
Противо-дифтерийная сыворотка в/м, пенициллин
Антибиотик группы пенициллинов. При ДН – назофарингеальный воздуховод
Госпитализация в ОТ
Госпитализация
По тяжести в РО или инфекционное отделение
YES
PRIMARY APPROACH: INHALATION INDUCTION WITH PRESERVATION OF SPONTANEOUS VENTILATION
IV INDUCTION
NEVER HESITATE TO ASK FOR EXTRA HELP
CONSIDER PEDI ENT STANDBY
Awake LMA followed by Inhalation Induction and intubation
Awake Intubation
Awake (mild sedation) Fiberoptic Intubation
Awake Tracheostomy
ADJUNTS
Optimal positioning
Secure IV Access
Optimal External Laryngeal Manipulation (OELM)
Oral and Nasal Airway
Jaw Thrust / Chin Lift
Topicalization
Anti-Sialagogue
Awake look prior to induction
Consider Waking up Patient
INTUBATION OPTIONS*
Familiarity with Technique
Adequacy of Mouth Opening
Consider Muscle Relaxation, Opioids, Propofol
Fiberoptic intubation through LMA
Video Laryngoscopy
LMA as Primary Airway Device
Sleep Fiber Optic (Oral/ Nasal)
Classic Direct Laryngoscopy
Light Wand / Stylets
APA
Difficult mask ventilation (MV) – during routine induction of anaesthesia in a child aged 1 to 8 yea
Difficult MV
Give 100% oxygen
Step A Optimise head position
Check equipment
Step B Insert oropharyngeal airway
Call for help again if not arrived
Second-line: Insert SAD (e.g. LMA™)
Good airway
Unexpected Difficult Ventilation/Oxygenation
Basic Rules
Failed
Exclude/treat anatomical airway obstruction
Re-open airway / Oro-pharyngeal airway
2-hand/2-person bag mask ventilation
Call for help
Exclude/treat functional airway obstruction
Laryngospasm/Opioid rigidity/Bronchospasm/Inflated stomach
Deepen anaesthesia/Paralyse/i.v. epinephrine/Gastric drain
Failed Oxgenation Plan A
Direct laryngoscopy
Exclude/remove foreign body in/from hypopharynx/larynx
Intubate trachea
Failed Oxygenation Plan B
Insert LMA
Wake-up
Ventilate through LMA*
Emergency surgery with LMA
direct laryngoscopy
tracheal intubation plan when
Failed intubation with good oxygenatio
ndary tracheal intubation plan
Call for help again if not arrived
Succeed
Consider modifying anaesthesia and surgery plan
Assess safety of proceeding with surgery using a SAD (e.g. LMA™)
Unsafe
Safe
Postpone surgery Wake up patient
Proceed with surgery
Consider 1 attempt
Verify intubation, leave
Erwartet schwieriger Atemweg
Akute Intervention notwendig ?
Nein
ggf. Verlegung
JA
Notfallversorgung
Plan A: Optimierte Gesichtsmaskenbeatmung
Lagerung (Nackenrolle)
Guedel- / Wendl-Tubus
Zwei-Hand-Beatmung
Plan B:
Ventilation über einen naso-pharyngealen Tubus oder über eine Larynxmaske
Algorithmus „Schwierige Beatmung/Oxygenierung"
Basismaßnahmen 1
Ausschluss/Behandlung einer anatomischen Atemwegsobstruktion
A) Optimierte Kopflagerung und Esmarch-Handgriff
B) Einsetzen eines Guedel-Tubus
C) 2-Hand-2-Personen Maskenbeatmung
Hilfe anfordern
Basismaßnahmen 2
Ausschluss/Behandlung einer funktionellen Atemwegsobstruktion
A) Oberfläche Anästhesie → Anästhesie i.v. vertiefen
B) Schwerer Laryngospasmus → Anästhesie i.v. vertiefen / Relaxation
C) Opioid-induzierte Muskelrigidität → Relaxation
D) Schwerer Bronchospasmus → Anästhesie i.v. vertiefen / Adrenalin i.v.
E) Massiv überblähter Magen → Entlasten
Plan A
Direkte Laryngoskopie zur Inspektion des Hypopharynx / der Glottis zum Ausschluss / zur Entfernung eines Fremdkörpers/Aspirat
Anschließend endotracheale Intubation
Intubation misslingt
Plan B
Einsetzen einer Larynxmaske / Beatmung über Larynxmaske
Patient aufwachen lassen
Larynxmaske
Notfall-Eingriff mit LMA oder fiber-optischer Intubation
Unexpected Difficult Intubation
Basic Rules
Failed
Call for help
Failed Intubation Plan A*
Failed
Failed Intubation Plan B
Insert LMA
Failed
Ventilate through LMA
Emergency surgery with LMA
ziemi
pomoc
znij resuscytację²,
wując proporcję
nięć do 2 oddechów³

Simple and intuitive

Forward only

Easy to memorize

Easy to practice

‘Open Box’

Acceptance across specialties & societies

Applicable to all situations

Structured algorithm

Anatomical Airway Obstructions

(head, mask, tonsils, secretion)

Functional Airway Obstructions

(depth, laryngo/ bronchospasm, rigidity)

Plan A

- *Direct laryngoscopy, exclude obstruction*

Plan B

- *Laryngeal mask airway / SAD*

OPEN BOX
&
LOCAL EXPERTISE

Unexpected Difficult Ventilation/Oxygenation

Basic Rules

Ensure adequate level of anaesthesia and muscle paralysis

Failed

Exclude/treat anatomical airway obstruction

Re-open airway / Oro-pharyngeal airway
2-hand/2-person bag-mask-ventilation

Failed

Call for help

Exclude/treat functional airway obstruction

Laryngospasm/Opioid rigidity/Bronchospasm/Inflated stomach
Deepen anaesthesia/Paralyse/i.v. epinephrine/Gastric drain

Failed

Failed Oxgenation Plan A

Direct laryngoscopy
Exclude/remove foreign body in/from hypopharynx/larynx
Intubate trachea

Failed

Failed Oxygenation Plan B

Insert LMA

Wake-up ← Ventilate through LMA* → Emergency surgery with LMA

*In a child with previously no signs, no symptoms and no history of / for a difficult airway → invasive ventilation techniques are not needed

07-09-2010 – Weiss M, Engelhardt T - Paediatr Anaesth. 2010;20:454-64

Unexpected Difficult Intubation

Basic Rules

Ensure adequate level of anaesthesia and muscle paralysis
Use laryngeal pressure or BURP

Failed

Maintain oxygenation, ventilation and anaesthesia

Call for help

Failed Intubation Plan A*

Use improved direct laryngoscopic technique/conditions or
Use indirect laryngoscopic technique
Limit to 2 intubation attempts

Failed

Maintain oxygenation, ventilation and anaesthesia

Consider surgery with LMA

Failed Intubation Plan B

Insert LMA
Perform fiberoptic tracheal intubation through the LMA
Limit to 2 intubation attempts

Failed

Maintain oxygenation, ventilation and anaesthesia

Wake-up ← Ventilate through LMA → Emergency surgery with LMA

*Rapid sequence induction intubation – Ensure deep anaesthesia and paralysis, oxygenate and ventilate via face mask or via LMA

07-09-2010 – Weiss M, Engelhardt T - Paediatr Anaesth. 2010;20:454-64

Take Home Messages

- Avoid hypoxia
- Prevent, recognize and treat **ANATOMICAL** and **FUNCTIONAL** airway obstructions
- Establish locally accepted algorithms based on simple and common principles
- Suitable equipment
- Acceptance across specialties and societies

Thank you

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