Pediatric Arrests: What can we do to save a life?

Strive to Revive
March 8th, 2019

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Medical Director, Assistant Professor
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University of Kentucky
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1

Disclosures

I have no relevant financial relationships to disclose.

2

Disclosures

I have no relevant financial relationships to disclose.

I DON'T believe in "see one, do one, teach one" method. I learn best from "watch one, botch one."

3

4

My Hope . . . Learn from Me

5

The Reality . . . . .

6

Pediatric codes are SUPER scary.

7

And for whatever reason . . .

8

18 years, 0 days

9

18 years, 0 days

10

11

17
years,
364 days

12

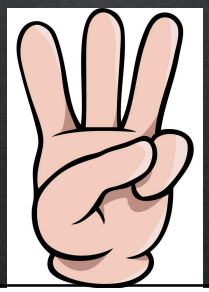
17 years, 364 days

13

How do we begin to address this scary situation?

14

Simplify it.



15

Simplify it.

2

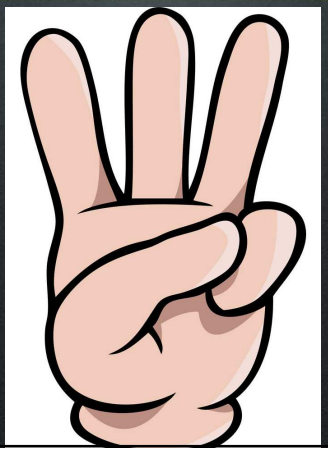
Arresting Airway

1

Prehospital Arrest

3

Arresting Access



16

4 year old boy found unresponsive by family.

CPR started within 3 minutes by a bystander.

17

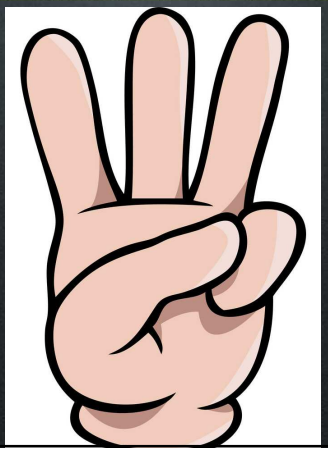
Simplify it.

2

Arresting Airway

1

Prehospital Arrest



3

Arresting Access

18

As an EMS provider, you arrive at the scene to find this . . .

19

You're awesome and start high quality CPR immediately.

Decision Time:
ET Intubation? (Yes or No)

20

Potential factors Influencing n ET Intubation vs BVM

- Story
- Distance
- Resources
- Safety
- Comfort
- Access

21

Effect of Out-of-Hospital Pediatric Endotracheal Intubation on Survival and Neurological Outcome

A Controlled Clinical Trial

Marianne Gausche, MD
Roger J. Lewis, MD, PhD
Samuel J. Stratton, MD, MPH
Bruce E. Haynes, MD
Carol S. Gunter, BSN, MPA
Suzanne M. Goodrich, RN, MSN
Pamela D. Poore, RN
Maureen D. McCollough, MD, MPH
Deborah P. Henderson, PhD, RN
Franklin D. Pratt, MD
James S. Seidel, MD, PhD

JAMA, February 9, 2000—Vol 283, No. 6

Table 3. Outcomes by Patient Subgroup*

	No. (%) of Patients		
	BVM	ETI	OR (95% CI)
Survival by Final Diagnosis			
SIDS	0/58 (0)	0/80 (0)	Undefined
Submersion injury	18/55 (33)	20/43 (47)	1.79 (0.78-4.07)
Head injury	8/25 (32)	9/36 (25)	0.71 (0.23-2.19)
Multiple trauma	7/37 (19)	12/51 (24)	1.32 (0.46-3.77)
Foreign body aspiration	9/13 (69)	5/13 (38)	0.28 (0.06-1.41)
Seizure	35/37 (95)	26/32 (81)	0.25 (0.05-1.33)
Child maltreatment	10/24 (42)	3/22 (5)	0.07 (0.01-0.58)†
Cardiopulmonary arrest	24/290 (8)	24/301 (8)	0.96 (0.53-1.73)
Respiratory arrest	46/54 (85)	33/54 (61)	0.27 (0.11-0.69)†
Reactive airway disease	6/12 (50)	3/10 (30)	0.43 (0.07-2.50)
Overall	123/404 (30)	110/416 (26)	0.82 (0.61-1.11)

22

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No Difference

Table 2. Intended Airway Management Method and Neurological Outcome*

	No. (%) of Patients	
	BVM (n = 404)	ETI (n = 416)
Normal or no change from baseline	39 (10)	33 (8)
No change from baseline status	33 (8)	25 (6)
Mild disability	20 (5)	27 (6)
Moderate disability	6 (1)	7 (2)
Severe disability	10 (2)	6 (1)
Coma/vegetative	15 (4)	12 (3)
Death	281 (70)	306 (74)

*BVM indicates bag-valve-mask ventilation; ETI, endotracheal intubation. There were no significant differences in outcomes between the 2 groups.

24

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25

17 Years Later

A comparison of pediatric airway management techniques during out-of-hospital cardiac arrest using the CARES database

Matthew L. Hansen[a,*], Amber Lin[a], Carl Eriksson[b], Mohamud Daya[a], Bryan McNally[c], Rongwei Fu[a,d], David Yanez[a,d], Dana Zive[a], Craig Newgard[a], the CARES surveillance group

[a] Center for Policy and Research in Emergency Medicine, Oregon Health & Science University, United States
[b] Department of Pediatrics, Oregon Health & Science University, United States
[c] Department of Emergency Medicine, Emory University, Atlanta, Georgia
[d] School of Public Health, Oregon Heath & Science University, United States

Resuscitation 120 (2017) 51–56

ABSTRACT

Objective: To compare odds of survival to hospital discharge among pediatric out-of-hospital cardiac arrest (OHCA) patients receiving either bag-valve-mask ventilation (BVM), supraglottic airway (SGA) or endotracheal intubation (ETI), after adjusting for the propensity to receive a given airway intervention.
Methods: Retrospective cohort study using the Cardiac Arrest Registry to Enhance Survival (CARES) database from January 1 201–December 31, 2015. The CARES registry includes data on cardiac arrests from 17 statewide registries and approximately 55 additional US cities. We included patients less than18 years of age who suffered a non-traumatic OHCA and received a resuscitation attempt by Emergency Medical Services (EMS). The key exposure was the airway management strategy (BVM, ETI, or SGA). The primary outcome was survival to hospital discharge.
Results: Of the 3793 OHCA cases included from 405 EMS agencies, 1724 cases were analyzed after limiting the analysis to EMS agencies that used all 3 devices. Of the 1724, 781 (45.3%) were treated with BVM only, 727 (42.2%) ETI, and 215 (12.5%) SGA. Overall, 20.7% had ROSC and 10.9% survived to hospital discharge. After using a propensity score analysis, the odds ratio for survival to hospital discharge for ETI compared to BVM was 0.39 (95%CI 0.26–0.59) and for SGA compared to BVM was 0.32 (95% CI 0.12–0.84). These relationships were robust to the sensitivity analyses including complete case, EMS-agency matched, and age-stratified.
Conclusions: BVM was associated with higher survival to hospital discharge compared to ETI and SGA. A large randomized clinical trial is needed to confirm these findings.

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Similar Results

A B S T R A C T

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Prehospital interventions in severely injured pediatric patients: Rethinking the ABCs

Kyle K. Sokol, MD, George E. Black, MD, Kenneth S. Azarow, MD, William Long, MD, Matthew J. Martin, MD, *and* Matthew J. Eckert, MD, *Tacoma, Washington*

Disclaimer : Trauma

J Trauma Acute Care Surg
Volume 79, Number 6

A B S T R A C T

Introduction: Airway compromise is the second leading cause of preventable death on the battlefield among US military casualties. Airway management is an important component of pediatric trauma care. Yet, intubation is a challenging skill with which many prehospital providers have limited pediatric experience. We compare mortality among pediatric trauma patients undergoing intubation in the prehospital setting versus a fixed-facility emergency department.
Methods: We queried the Department of Defense Trauma Registry (DODTR) for all pediatric encounters in Iraq and Afghanistan from January 2007 to January 2016. We compared outcomes of pediatric subjects undergoing intubation in the prehospital setting versus the emergency department (ED) setting.
Results: During this period, there were 3439 pediatric encounters (8.0% of DODTR encounters during this time). Of those, 802 (23.3%) underwent intubation (prehospital = 211, ED = 591). Compared to patients undergoing ED intubation, patients undergoing prehospital intubation had higher median composite injury severity scores (17 versus 16) and lower survival rates (66.8% versus 79.9%, $p < 0.001$). On univariable logistic regression analysis, prehospital intubation increased mortality odds (OR 1.97, 95% CI 1.39–2.79). After adjusting for confounders, the association between prehospital intubation and death remained significant (OR 2.03, 95% CI 1.35–3.06).
Conclusions: Pediatric trauma subjects intubated in the prehospital setting had worse outcomes than those intubated in the ED. This finding persisted after controlling for measurable confounders.

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29

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It is NOT a failure bringing

30

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31

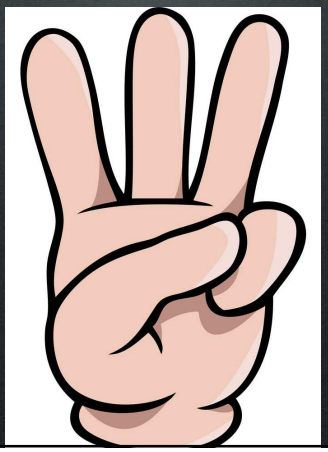
Simplify it.

2

Arresting Airway

1

Prehospital Arrest



3

Arresting Access

32

Simplify it.

Arresting Airway

You make the decision to intubate.

What size ET tube do I need?

33

Picking an ET Tube

$$\frac{16 + \text{Age (in yrs)}}{4}$$

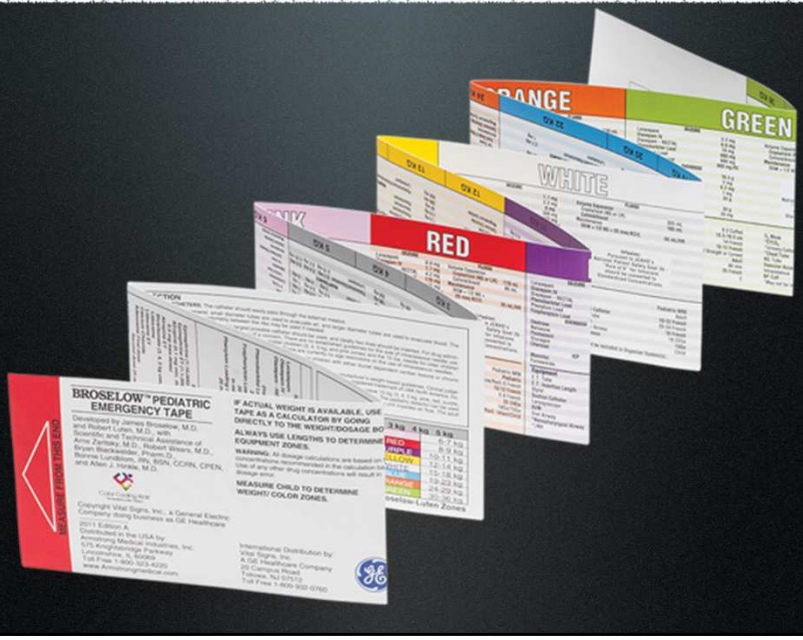
34

Picking an ET Tube

$$4 + \frac{1}{4} \text{ Age (in yrs)}$$

35

Picking an ET Tube

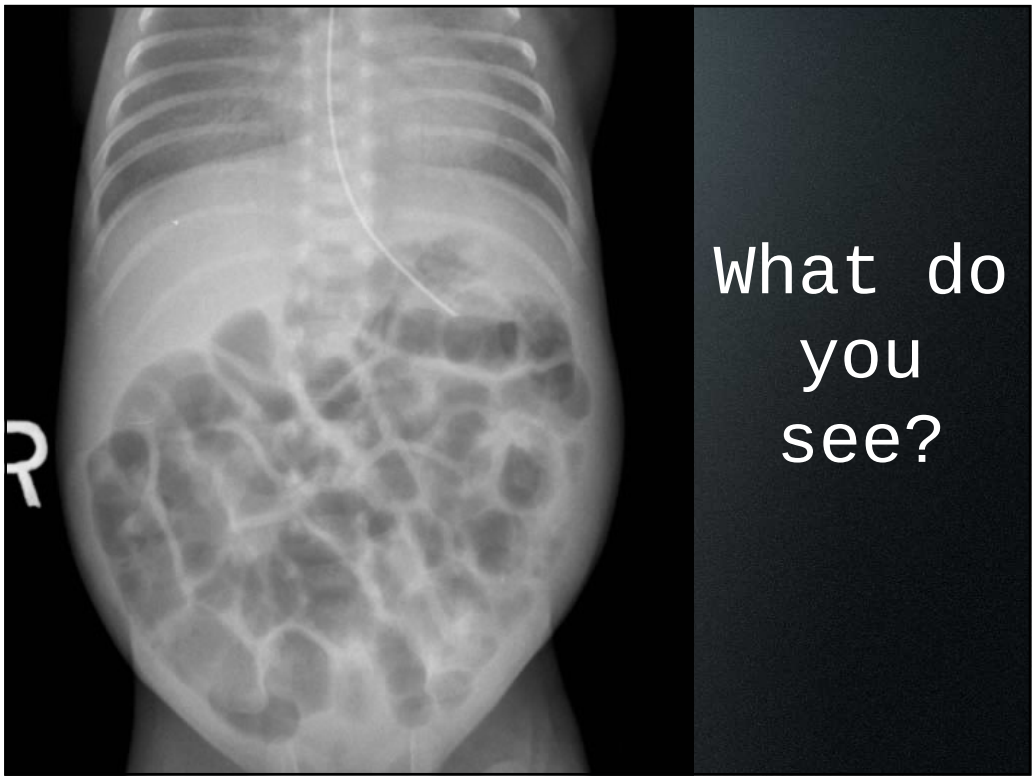


36

Maybe you had to BVM the child for a while before you intubated.

And you (without looking) know that the kid's tummy would look like this on XR.

37



38

39

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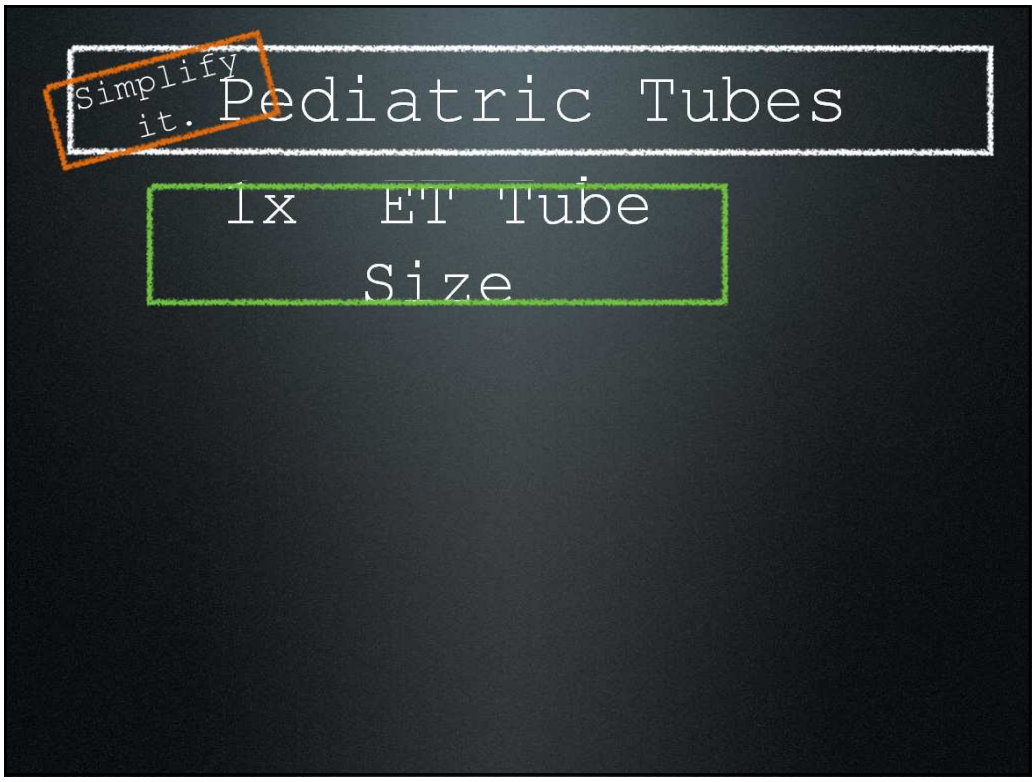
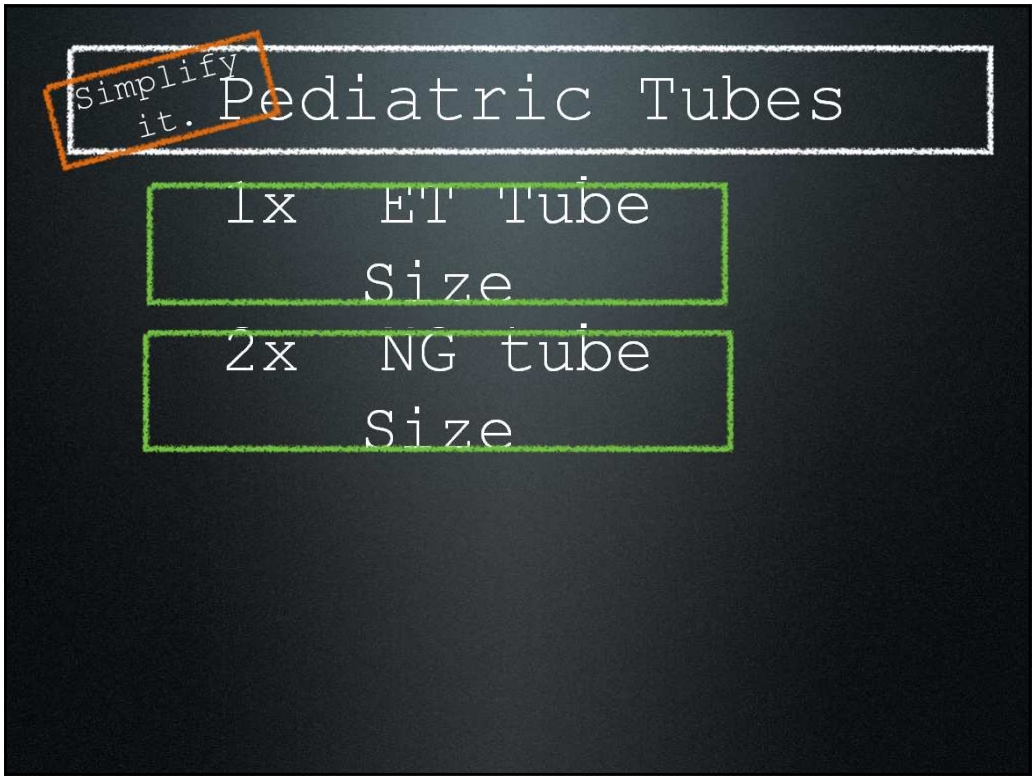
What size NG do you need?

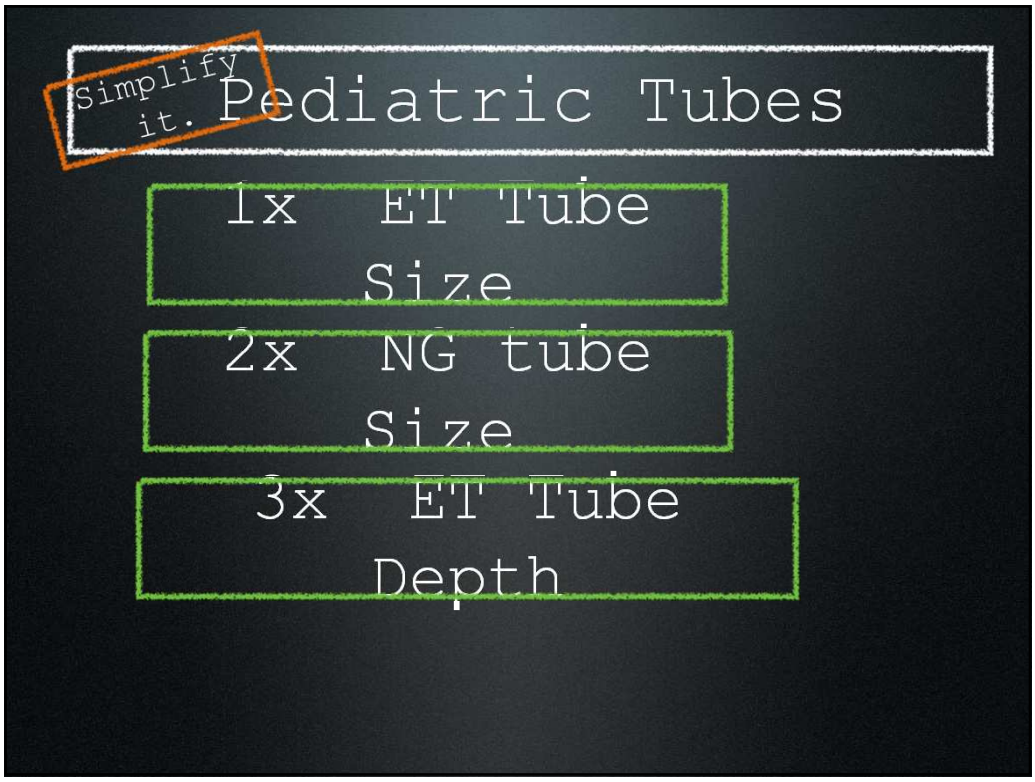
40


Simplify it.
Pediatric Tubes
1x ET Tube Size

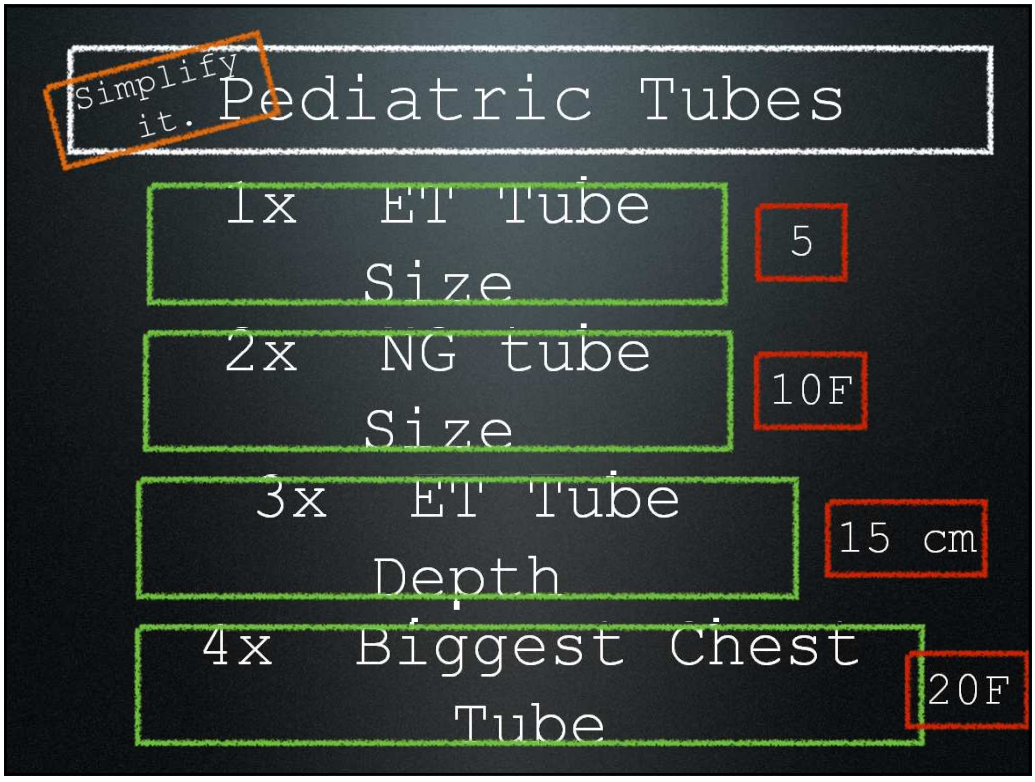
41


Simplify it.
Pediatric Tubes
1x ET Tube Size
2x NG tube Size

42


Simplify it.
Pediatric Tubes
1x ET Tube Size
2x NG tube Size
3x ET Tube Depth

43


Simplify it.
Pediatric Tubes
1x ET Tube Size
5
2x NG tube Size
10F
3x ET Tube Depth
15 cm
4x Biggest Chest Tube
20F

44

One of My Screw Ups

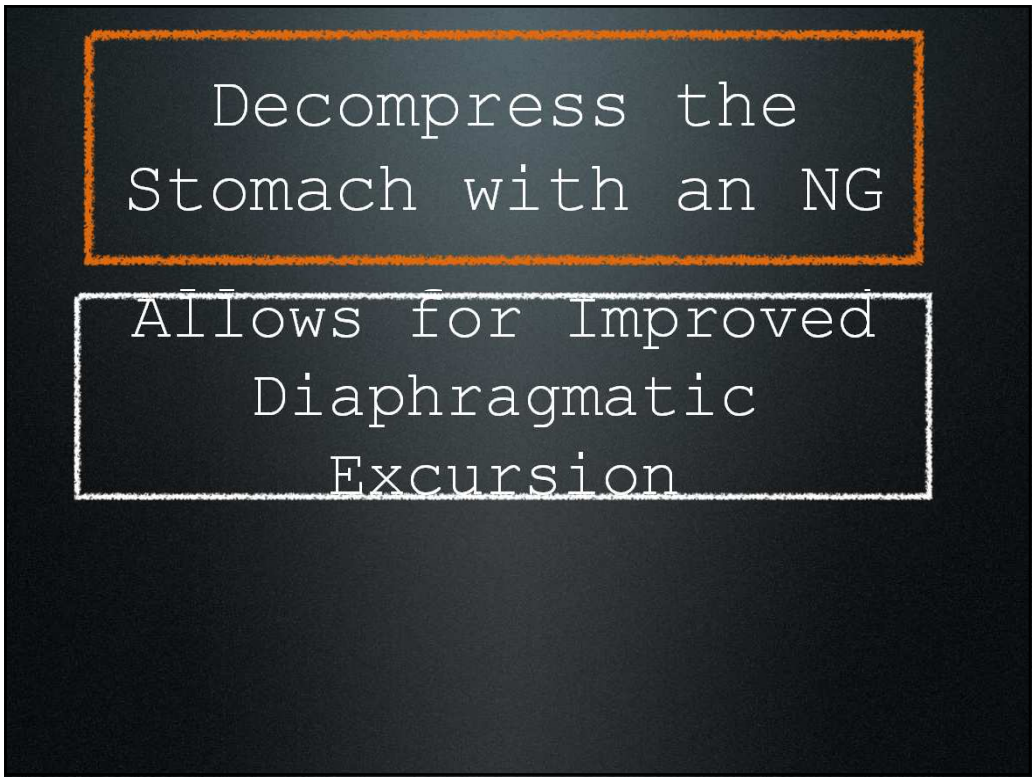
What I should have done with a belly full of air . . .

Decompress the Stomach with an NG

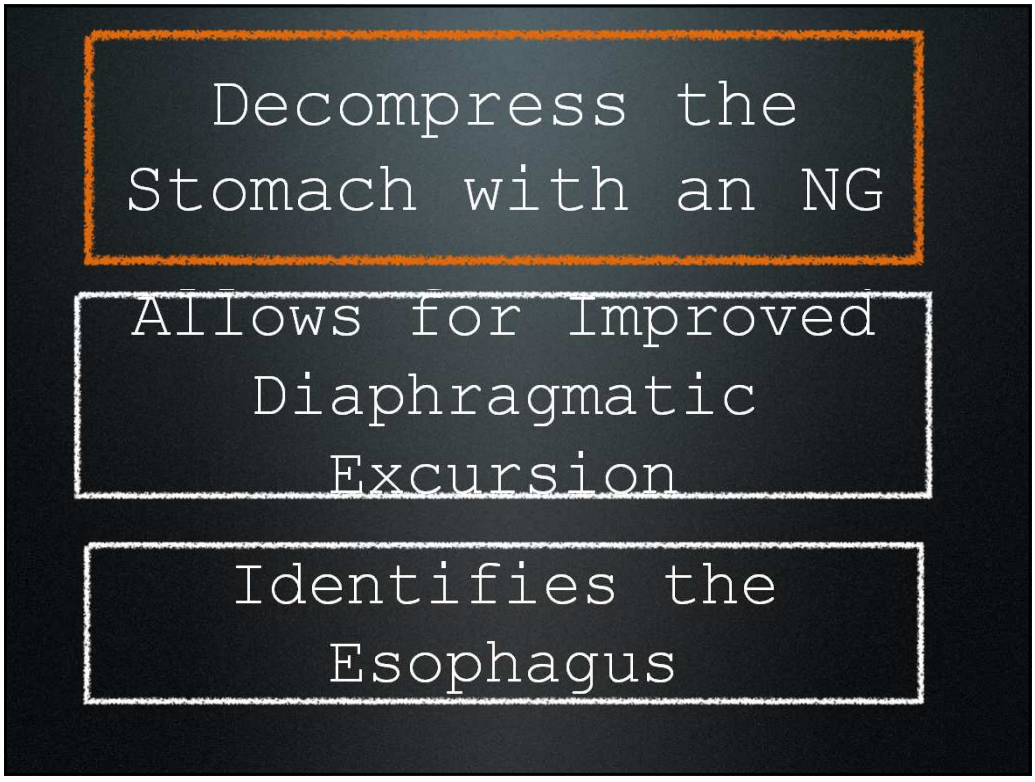
45

Decompress the Stomach with an NG

46

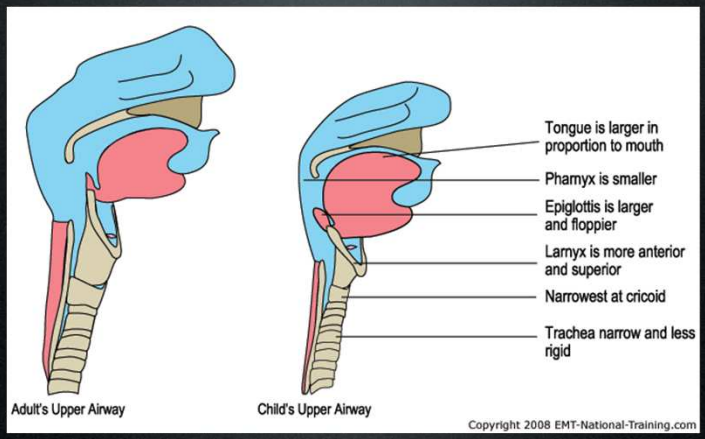

Decompress the Stomach with an NG
Allows for Improved Diaphragmatic Excursion

47


Decompress the Stomach with an NG
Allows for Improved Diaphragmatic Excursion
Identifies the Esophagus

48

. . . continuing with the Arresting Airway



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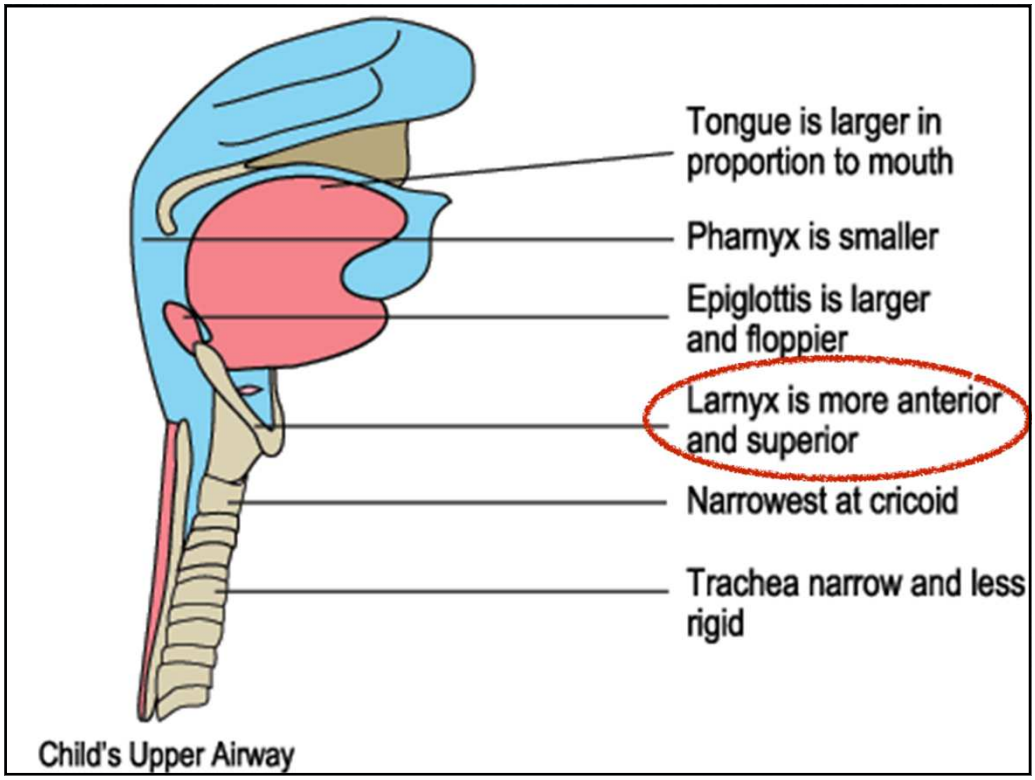
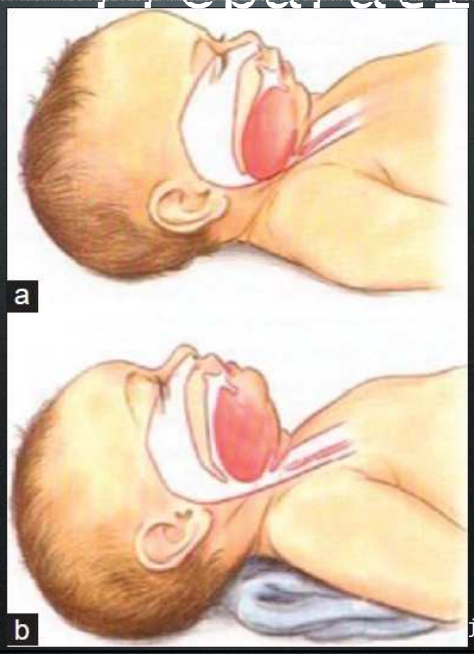


50

Simplify it.

Intubation Preparation



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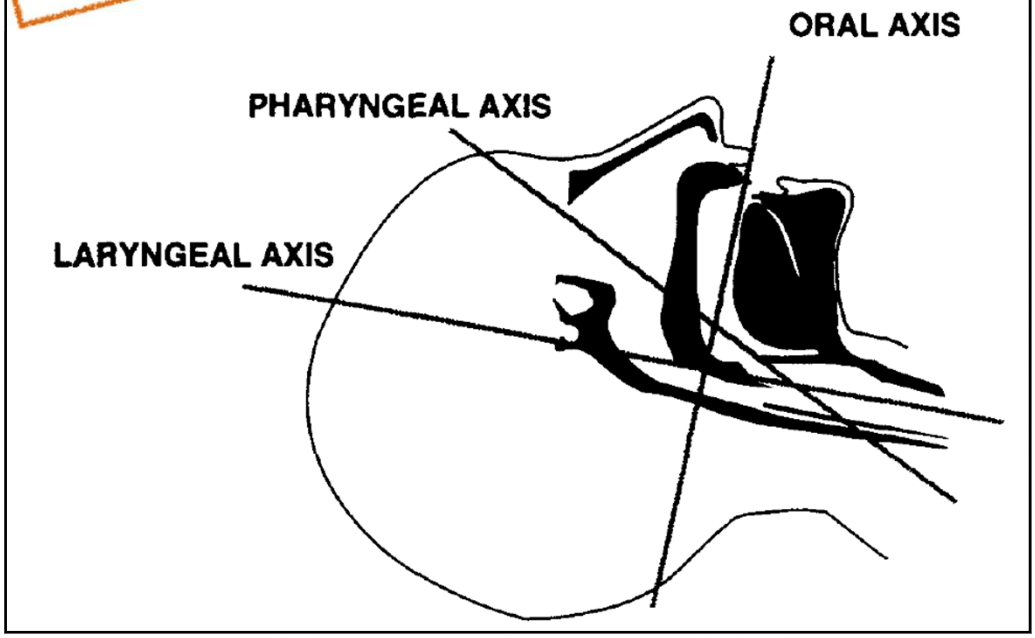
51

Simplify it.

Intubation Preparation



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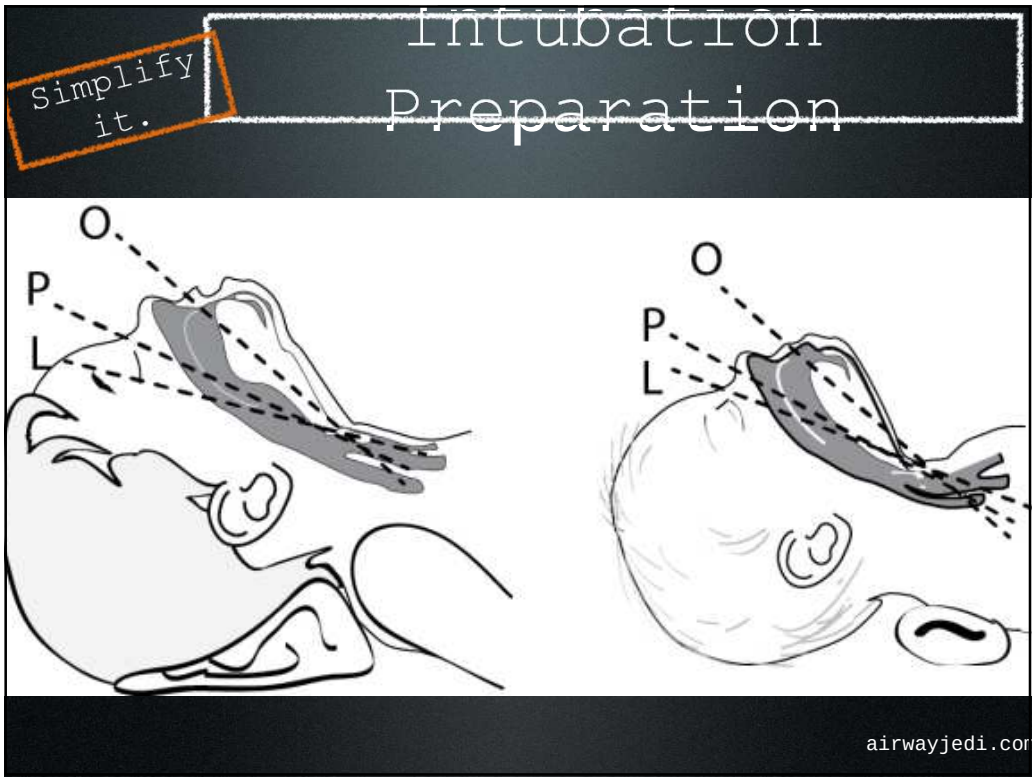
Simplify it.
Intubation Preparation
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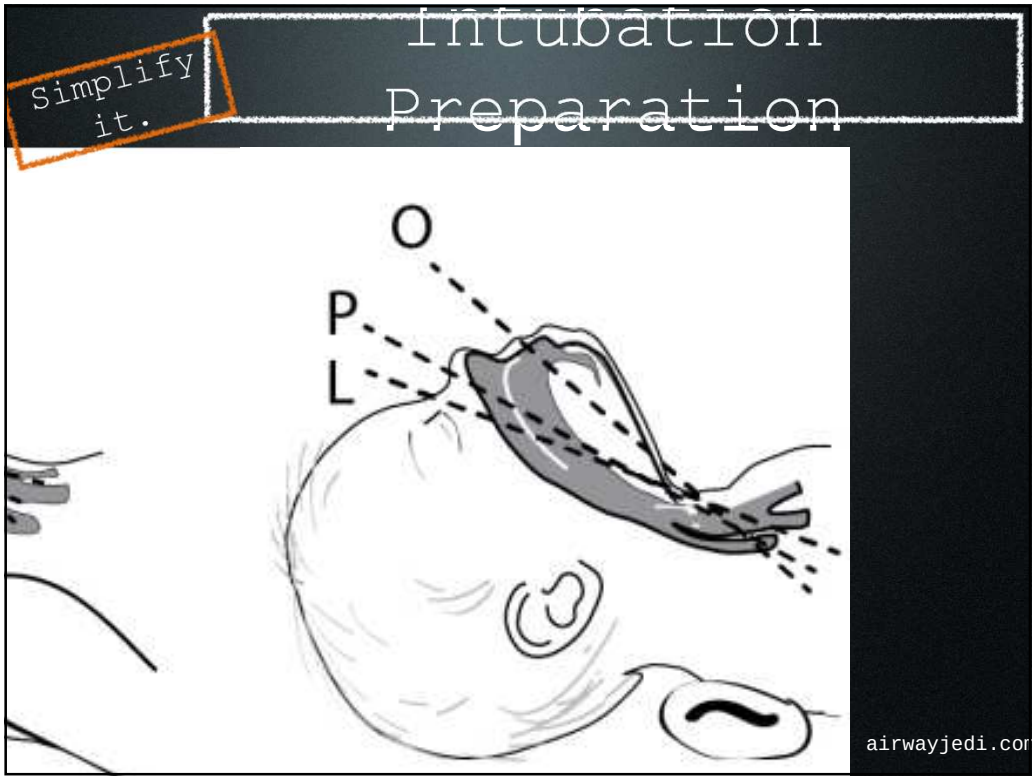
airwayjedi.com

53


Simplify it.
Intubation Preparation
O
P
L
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54

Another of My Goof Ups

What I should have done to facilitate a successful intubation. . .

Placed a Shoulder Roll

55

Pre-Intubation Positioning

SCIENTIFIC REPORTS

OPEN

Improvement of laryngoscopic view by hand-assisted elevation and caudad traction of the shoulder during tracheal intubation in pediatric patients

Received: 19 September 2018
Accepted: 13 December 2018
Published online: 04 February 2019

Jin Hee Ahn, Doyeon Kim, Nam-su Gil, Yong Hun Son, Bong Gyu Seong & Ji Seon Jeong

Basically, this maneuver is a shoulder roll.

56

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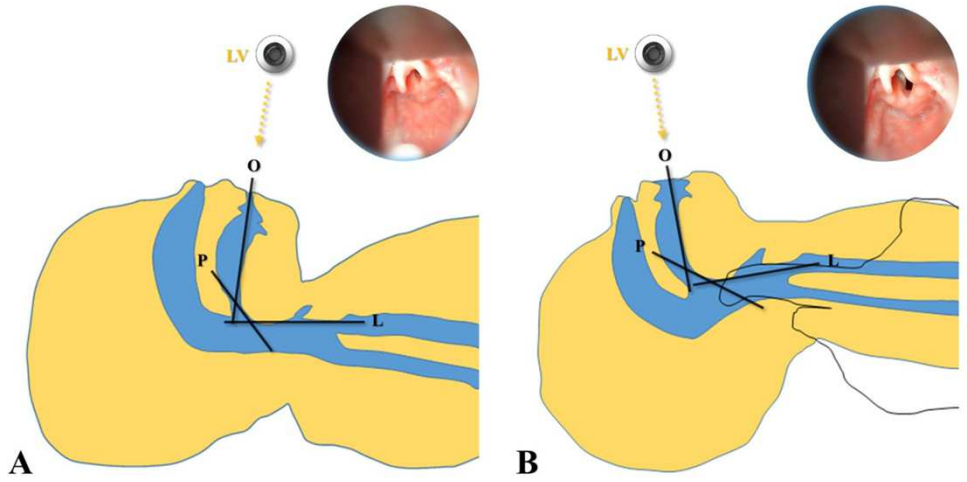

Figure 1. Three axes and line of vision (**A**) before and (**B**) after HA-ECTS. Abbreviations: O, oral axis; P, pharyngeal axis; L, laryngeal axis; LV, line of vision.

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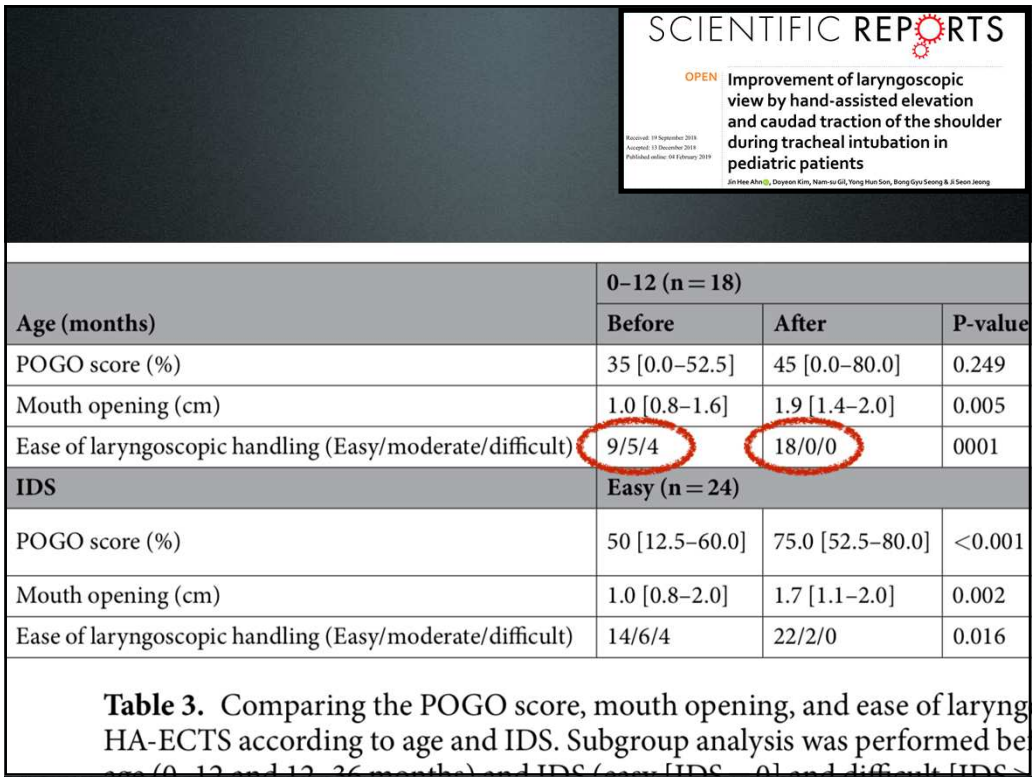
SCIENTIFIC REPORTS
OPEN
Improvement of laryngoscopic view by hand-assisted elevation and caudad traction of the shoulder during tracheal intubation in pediatric patients

	0–12 (n = 18)			12–36 (n = 19)		
Age (months)	**Before**	**After**	**P-value**	**Before**	**After**	**P-value**
POGO score (%)	35 [0.0–52.5]	45 [0.0–80.0]	0.249	20 [10.0–50.0]	60 [40.0–80.0]	0.007
Mouth opening (cm)	1.0 [0.8–1.6]	1.9 [1.4–2.0]	0.005	1.0 [0.8–2.0]	1.8 [1.2–2.0]	0.003
Ease of laryngoscopic handling (Easy/moderate/difficult)	9/5/4	18/0/0	0001	10/5/4	16/3/0	0.081
IDS	**Easy (n = 24)**			**Difficult (n = 13)**		
POGO score (%)	50 [12.5–60.0]	75.0 [52.5–80.0]	<0.001	0.0 [0.0–25.0]*	0.0 [0.0–20.0]†	0.551
Mouth opening (cm)	1.0 [0.8–2.0]	1.7 [1.1–2.0]	0.002	1.0 [0.8–1.4]	2.0 [1.5–2.0]	0.006
Ease of laryngoscopic handling (Easy/moderate/difficult)	14/6/4	22/2/0	0.016	5/4/4	12/1/0	0.016

Table 3. Comparing the POGO score, mouth opening, and ease of laryngoscopic handling before and after HA-ECTS according to age and IDS. Subgroup analysis was performed before and after HA-ECTS according to age (0–12 and 12–36 months) and IDS (easy [IDS = 0] and difficult [IDS > 0]). All data are presented as median [range] and number. *P = 0.001 versus easy airway. †P < 0.001 versus easy airway. Abbreviations: POGO, percentage of glottis opening; HA-ECTS, hand-assisted elevation and caudad traction of the shoulder; IDS, intubation difficulty score.

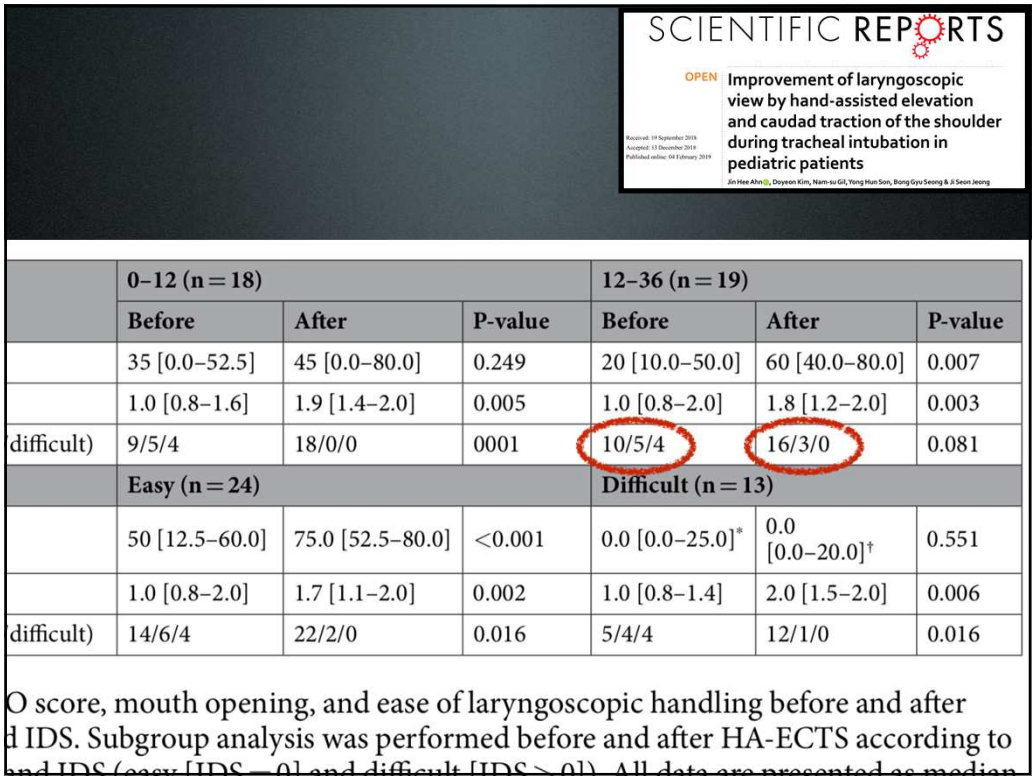
58



Age (months)	0–12 (n = 18)		
	Before	After	P-value
POGO score (%)	35 [0.0–52.5]	45 [0.0–80.0]	0.249
Mouth opening (cm)	1.0 [0.8–1.6]	1.9 [1.4–2.0]	0.005
Ease of laryngoscopic handling (Easy/moderate/difficult)	9/5/4	18/0/0	0001
IDS	**Easy (n = 24)**		
POGO score (%)	50 [12.5–60.0]	75.0 [52.5–80.0]	<0.001
Mouth opening (cm)	1.0 [0.8–2.0]	1.7 [1.1–2.0]	0.002
Ease of laryngoscopic handling (Easy/moderate/difficult)	14/6/4	22/2/0	0.016

Table 3. Comparing the POGO score, mouth opening, and ease of laryng
HA-ECTS according to age and IDS. Subgroup analysis was performed be
age (0–12 and 12–36 months) and IDS (easy [IDS = 0] and difficult [IDS >

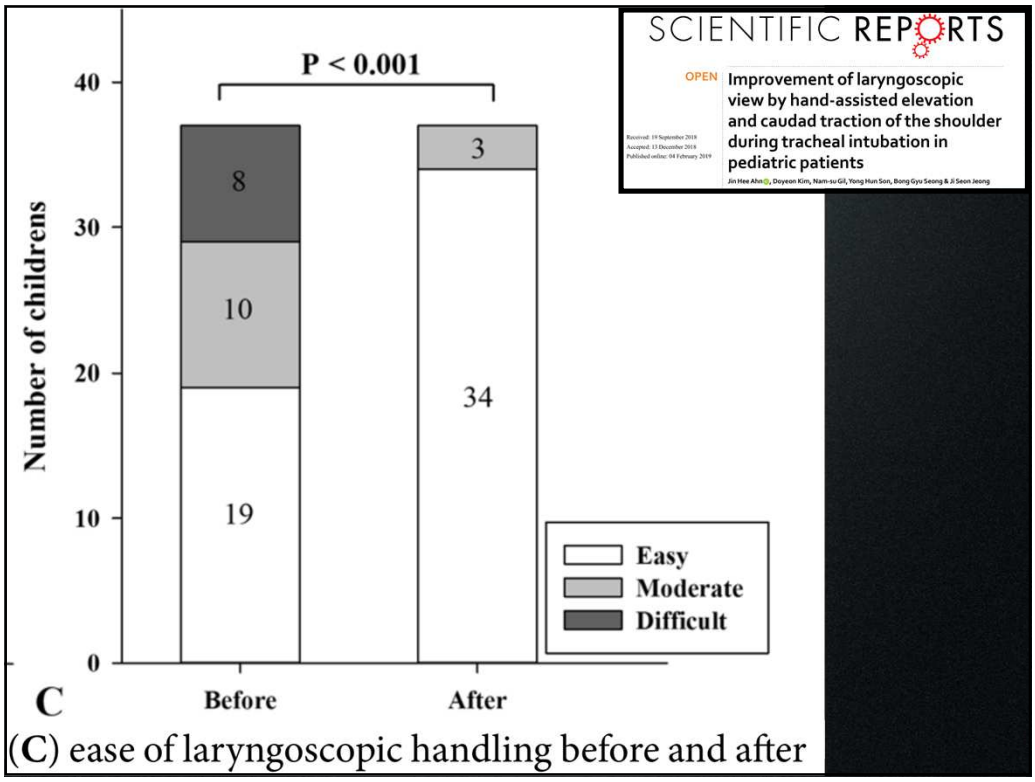
59



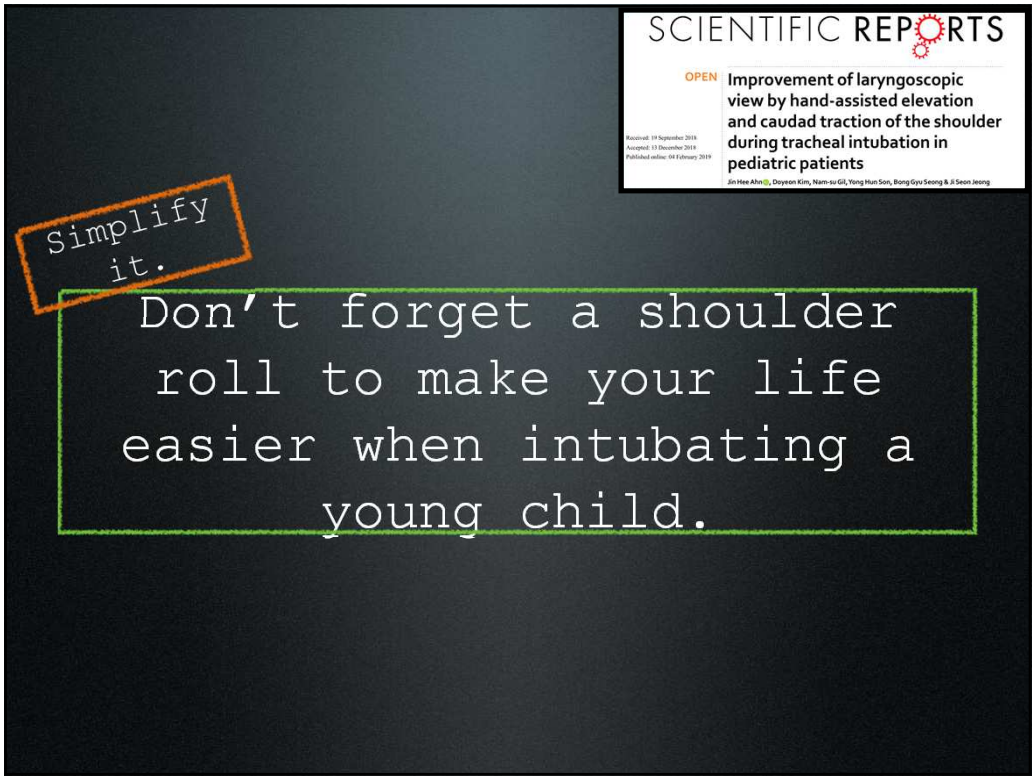
	0–12 (n = 18)			12–36 (n = 19)		
	Before	After	P-value	Before	After	P-value
	35 [0.0–52.5]	45 [0.0–80.0]	0.249	20 [10.0–50.0]	60 [40.0–80.0]	0.007
	1.0 [0.8–1.6]	1.9 [1.4–2.0]	0.005	1.0 [0.8–2.0]	1.8 [1.2–2.0]	0.003
difficult)	9/5/4	18/0/0	0001	10/5/4	16/3/0	0.081
	Easy (n = 24)			Difficult (n = 13)		
	50 [12.5–60.0]	75.0 [52.5–80.0]	<0.001	0.0 [0.0–25.0]*	0.0 [0.0–20.0]†	0.551
	1.0 [0.8–2.0]	1.7 [1.1–2.0]	0.002	1.0 [0.8–1.4]	2.0 [1.5–2.0]	0.006
difficult)	14/6/4	22/2/0	0.016	5/4/4	12/1/0	0.016

O score, mouth opening, and ease of laryngoscopic handling before and after
d IDS. Subgroup analysis was performed before and after HA-ECTS according to
and IDS (easy [IDS = 0] and difficult [IDS > 0]). All data are presented as median

60


SCIENTIFIC REPORTS
OPEN
Improvement of laryngoscopic view by hand-assisted elevation and caudad traction of the shoulder during tracheal intubation in pediatric patients
P < 0.001
Number of childrens
40
30
20
10
0
8
10
19
3
34
Easy
Moderate
Difficult
C
Before
After
(C) ease of laryngoscopic handling before and after

61


SCIENTIFIC REPORTS
OPEN
Improvement of laryngoscopic view by hand-assisted elevation and caudad traction of the shoulder during tracheal intubation in pediatric patients
Simplify it.
Don't forget a shoulder roll to make your life easier when intubating a young child.

62

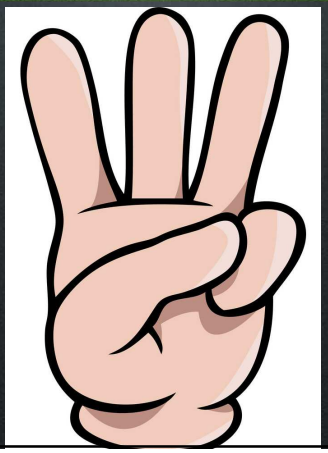
Simplify it.

2

Arresting Airway

1

Prehospital Arrest



3

Arresting Access

63

Simplify it.

Arresting Access

What methods are available to administer resuscitation meds/fluids?

Intravenous (IV)

Interosseous (IO)

~~Hypodermoclysis (Subcutaneous)~~

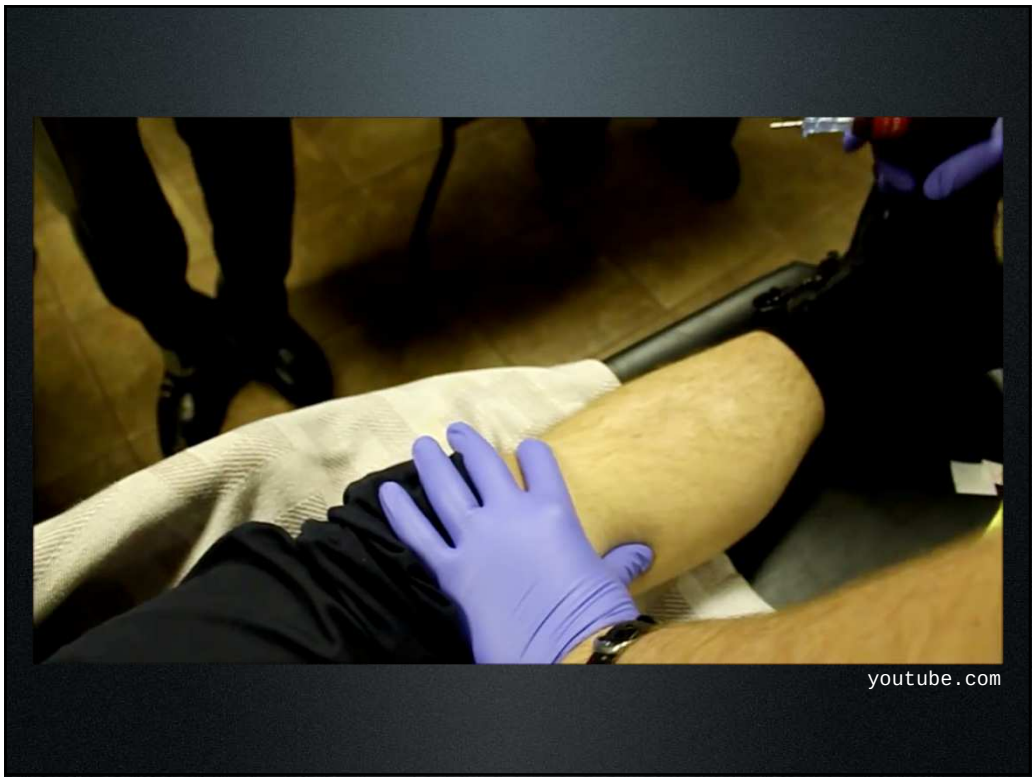
64

65

Something I Could Have Done Better

Every time I've used this, I've wished it had been 10 minutes

66



67

Our Case

4 year old boy arresting. We've done everything we can think of . .

. . . . . and he's still arresting.

68

. . . I need help from my PICU colleague Dr. Erin Powell.

69

Take Home Points

It is NOT a failure bringing in a NON-intubated, adequately oxygenated pediatric arrest patient by BVM.

70

It is NOT a failure bringing in a NON-intubated, adequately oxygenated pediatric arrest patient by BVM.

Simplify your arresting airway with easy multiplication and a shoulder roll.

71

It is NOT a failure bringing in a NON-intubated, adequately oxygenated pediatric arrest patient by BVM.

Simplify your arresting airway with easy multiplication and a shoulder roll.

Don’t be afraid to pull the trigger on the IO.

72

Pediatric Arrests: What can we do to save a life?

Strive to Revive
March 8th, 2019

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