L'Association Tunisienne de Réanimation
La Société Tunisienne d'Anesthésie d'Analgésie et de Réanimation
3ème JOURNÉE COMMUNE de RÉANIMATION
Le 30 Juin 2018, à L'Hôtel Le Royal Hammamet

Gestion de l'intubation du patient obèse au bloc et à la réanimation

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Disclosures

Consultants with honorarium

- Dräger
- Fisher-Paykel
- Baxter
- Xenios-Fresenius
- Medtronic

Objectives

1. Background : 2 situations = planed and unplanned difficult ventilation/intubation

2. How to detect difficult ICU intubation ?

3. How to optimize difficult intubation procedure in obese patients in both Operating room and ICU ?

Risk n°1

Intubation and/or difficult ventilation !

Severe hypoxia, cerebral anoxia…

Cardiac Arrest and Death

KEY MESSAGE

In case of difficult intubation

↓

1. OXYGENATION

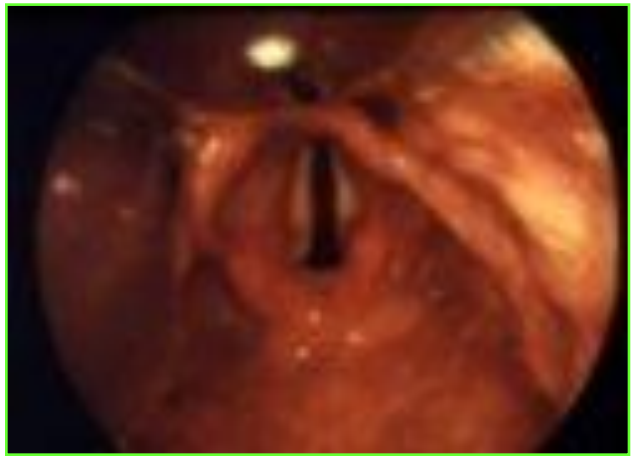
PRIORITY OVER EVERYTHING ELSE

+

2. CALL FOR HELP

2 MAIN SITUATIONS

1. Non difficult INTUBATION

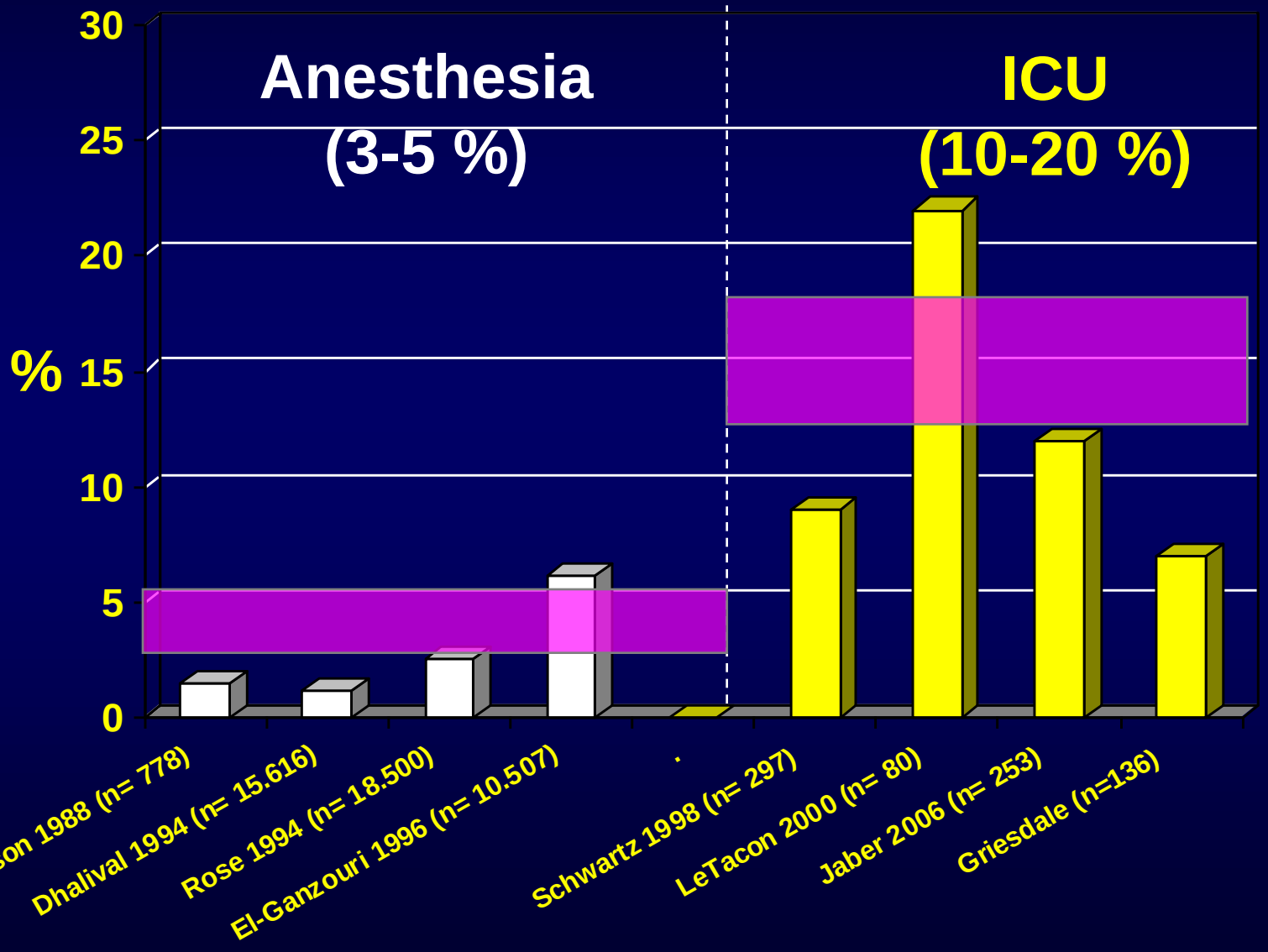


2. DIFFICULT INTUBATION

2.a/ **Planed** DIFFICULT INTUBATION

2.b/ **Unplaned** DIFFICULT INTUBATION

Difficult Intubation (= morbidity)



Difficult Intubation
In obese patient in ICU

More complications ?

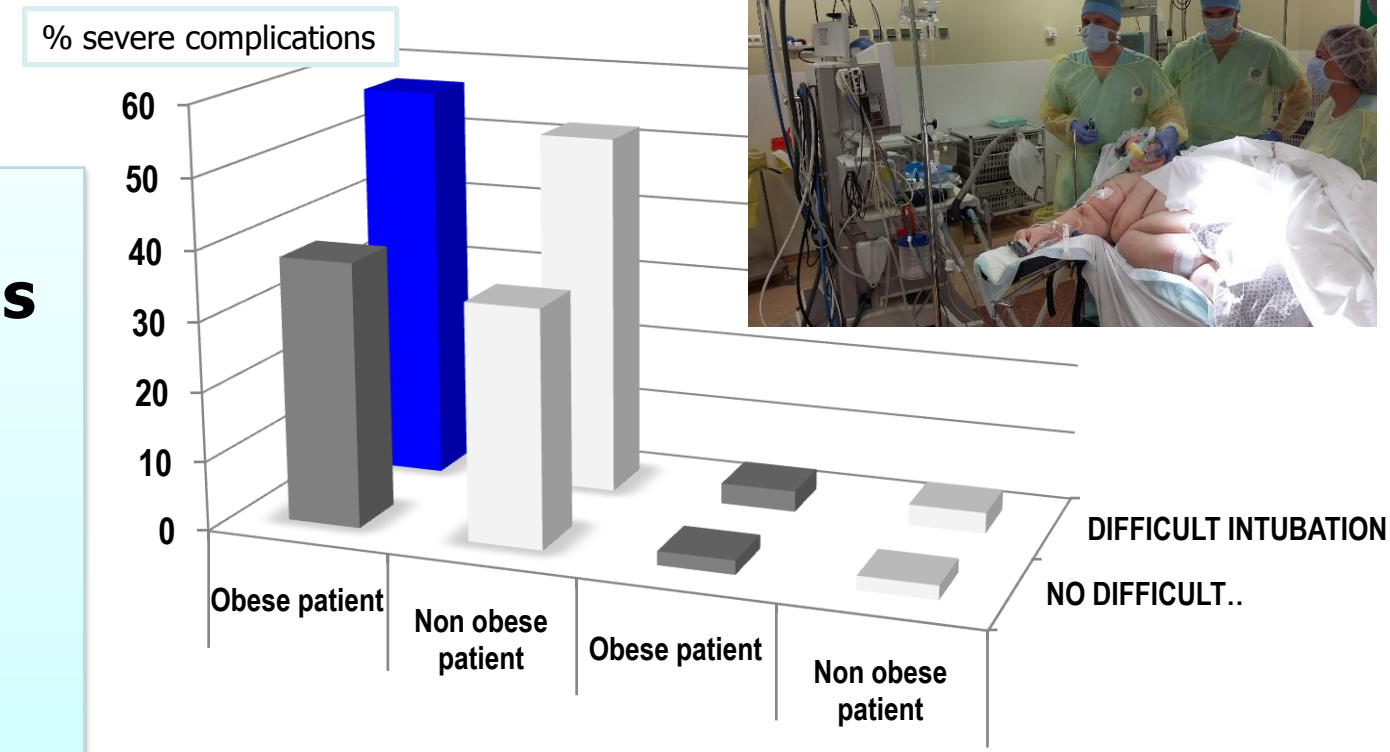
DIFFICULT INTUBATION IN ANESTHESIA AND ICU

British Journal of Anaesthesia Page 1 of 10
doi:10.1093/bja/aeu373

2015 BJA

Difficult intubation in obese patients: incidence, risk factors, and complications in the operating theatre and in intensive care units

A. De Jong[1], N. Molinari[2], Y. Pouzeratte[1], D. Verzilli[1], G. Chanques[1], B. Jung[1,3], E. Futier[1], P.-F. Perrigault[6], P. Colson[4], X. Capdevila[5] and S. Jaber[1,3*]



Risk of complications

1. Difficult Intubation
2. Obesity
3. Critical care ICU patient

Clinical practice and risk factors for immediate complications of endotracheal intubation in the intensive care unit: A prospective, multiple-center study*

Crit Care Med 2006 Vol. 34, No. 9

Samir Jaber, MD, PhD; Jibba Amraoui, MD; Jean-Yves Lefrant, MD, PhD; Charles Arich, MD; Robert Cohendy, MD, PhD; Liliane Landreau, MD; Yves Calvet, MD; Xavier Capdevila, MD, PhD; Aba Mahamat, MD; Jean-Jacques Eledjam, MD, PhD

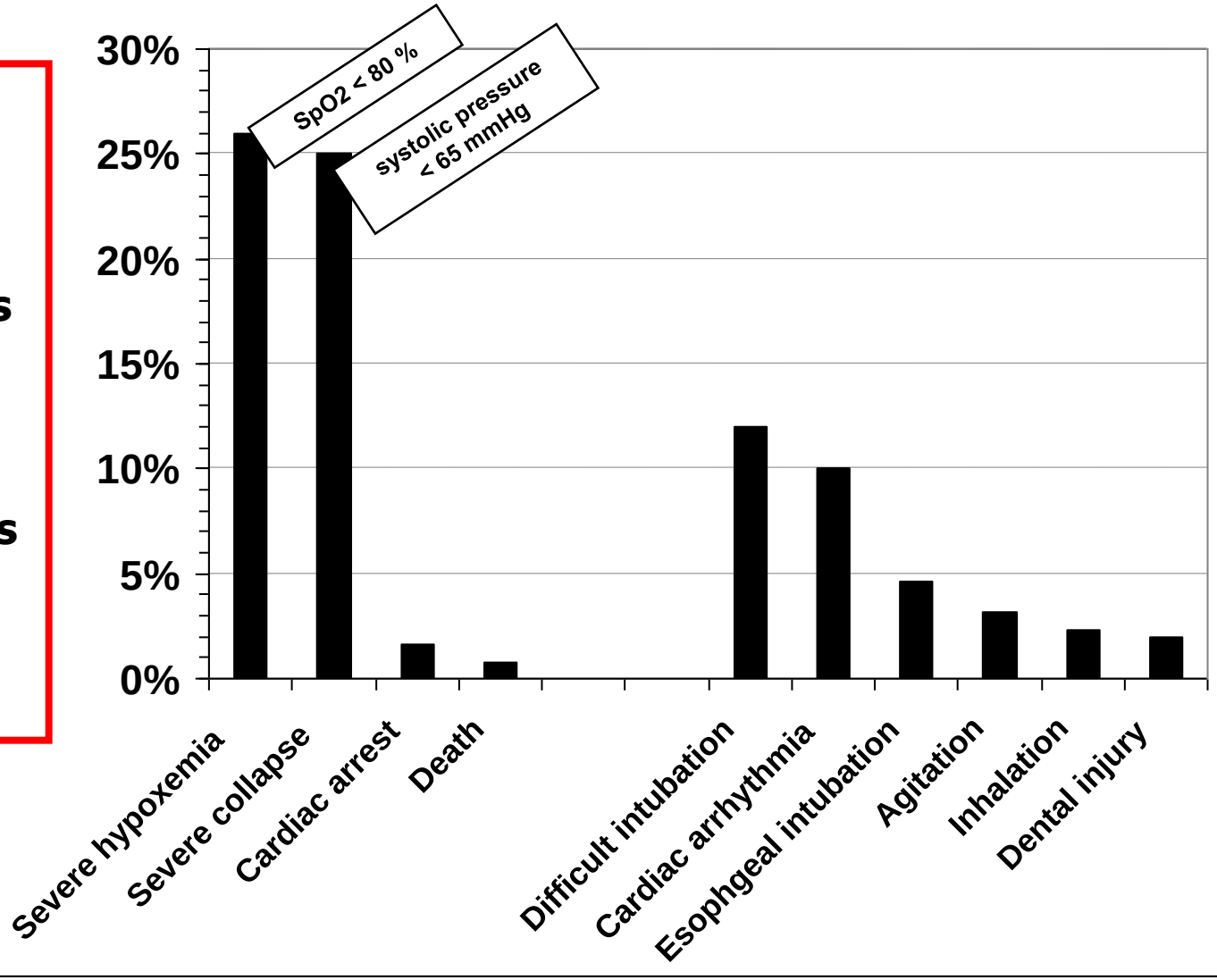
Intubations in ICU (n=253)

1.Complications "overall"

= 40-50%

2. Complications severe life threatening

= 25-40%



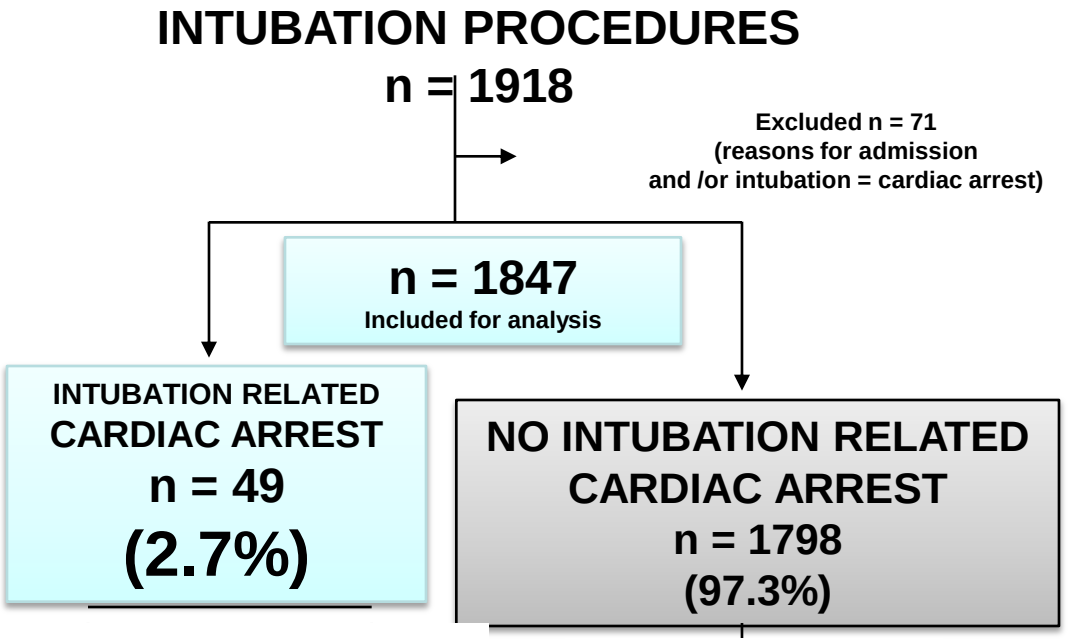
Cardiac Arrest and Mortality Related to Intubation Procedure in Critically Ill Adult Patients: A Multicenter Cohort Study

Audrey De Jong, MD, PhD[1,2]; Amélie Rolle, MD[1,3]; Nicolas Molinari, PhD[4];
Catherine Paugam-Burtz, MD, PhD[5,6]; Jean-Michel Constantin, MD, PhD[7];
Jean-Yves Lefrant, MD, PhD[8]; Karim Asehnoune, MD, PhD[9]; Boris Jung, MD, PhD[2,10];
Emmanuel Futier, MD, PhD[7]; Gérald Chanques, MD, PhD[1,2]; Elie Azoulay, MD, PhD[11]; Samir Jaber, MD, PhD[1,2]

Crit Care Med 2018 jan

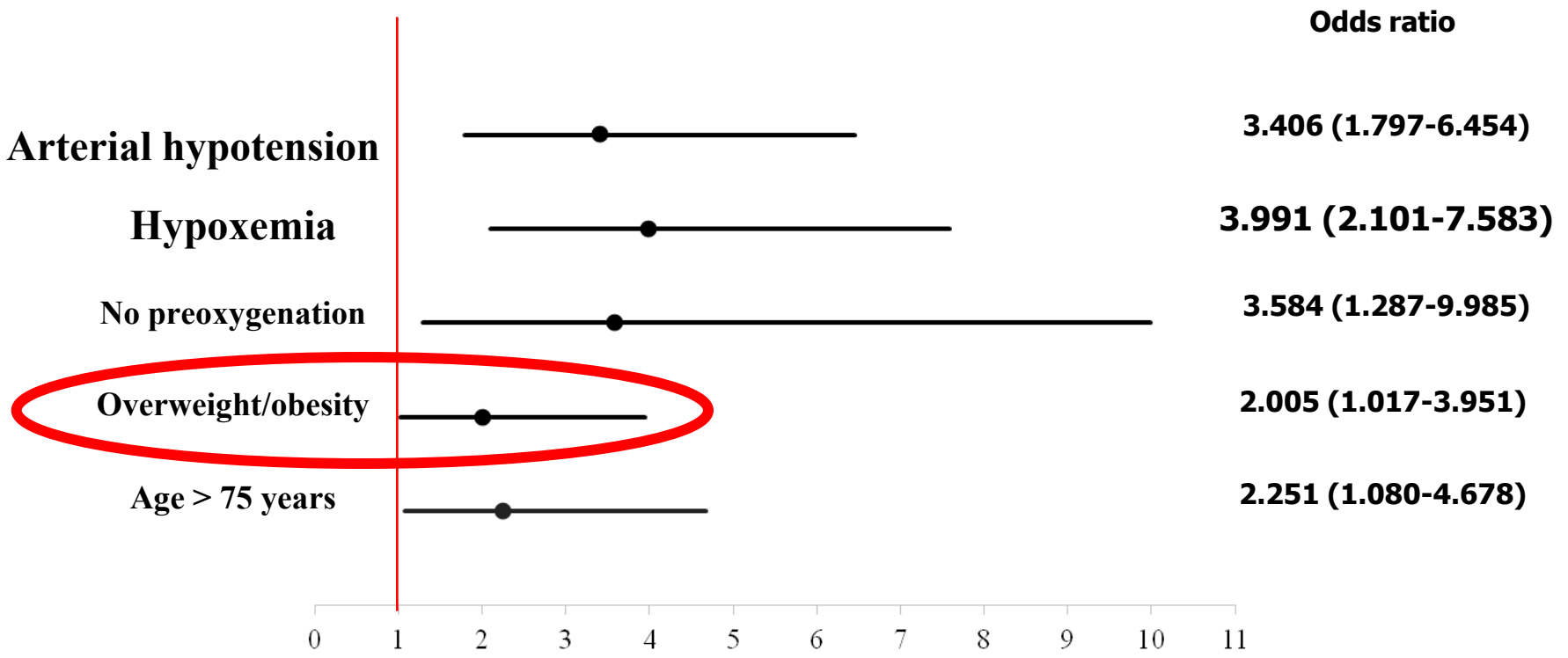
Ultime complication related to intubation : cardiac arrest/death !

CARDIAC ARREST AND MORTALITY RELATED TO INTUBATION PROCESS



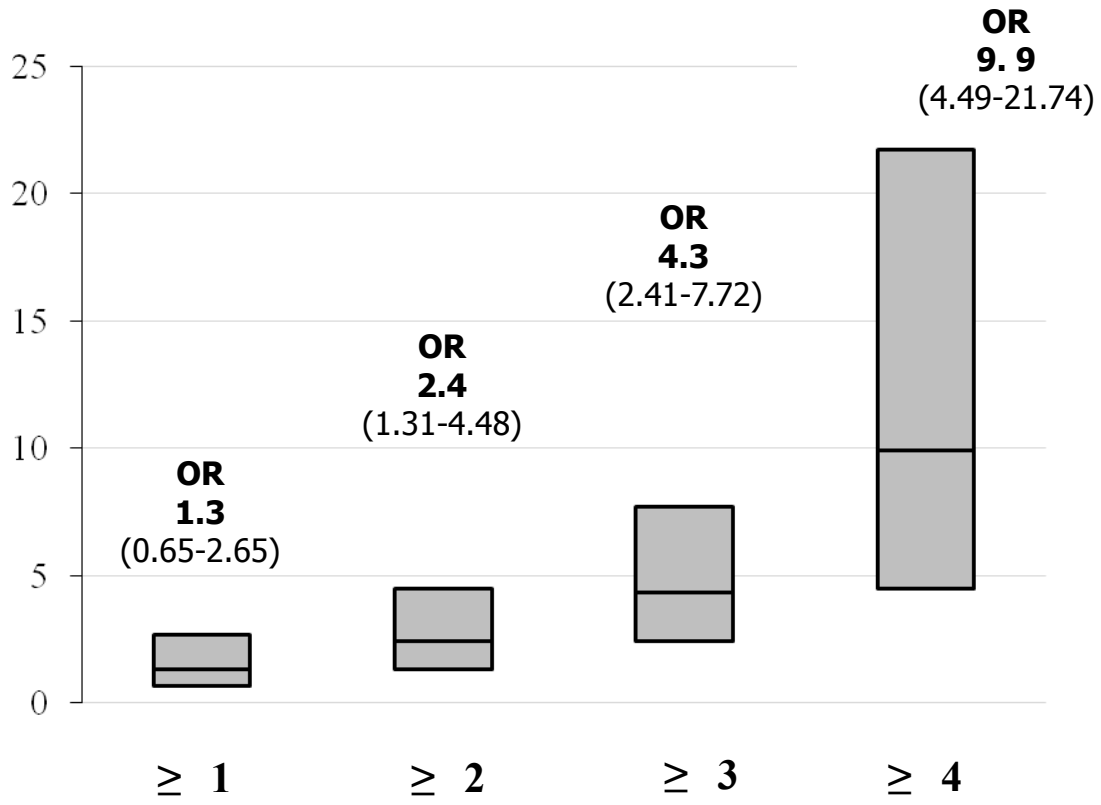
De Jong et al. Crit Care Med 2018 jan

Five predictive factors of cardiac arrest during intubation procedure in multivariate analysis



De Jong et al. Crit Care Med 2018 jan

Odds ratio of presenting a cardiac arrest related to intubation according to presence of risk factors



De Jong et al. Crit Care Med 2018 jan

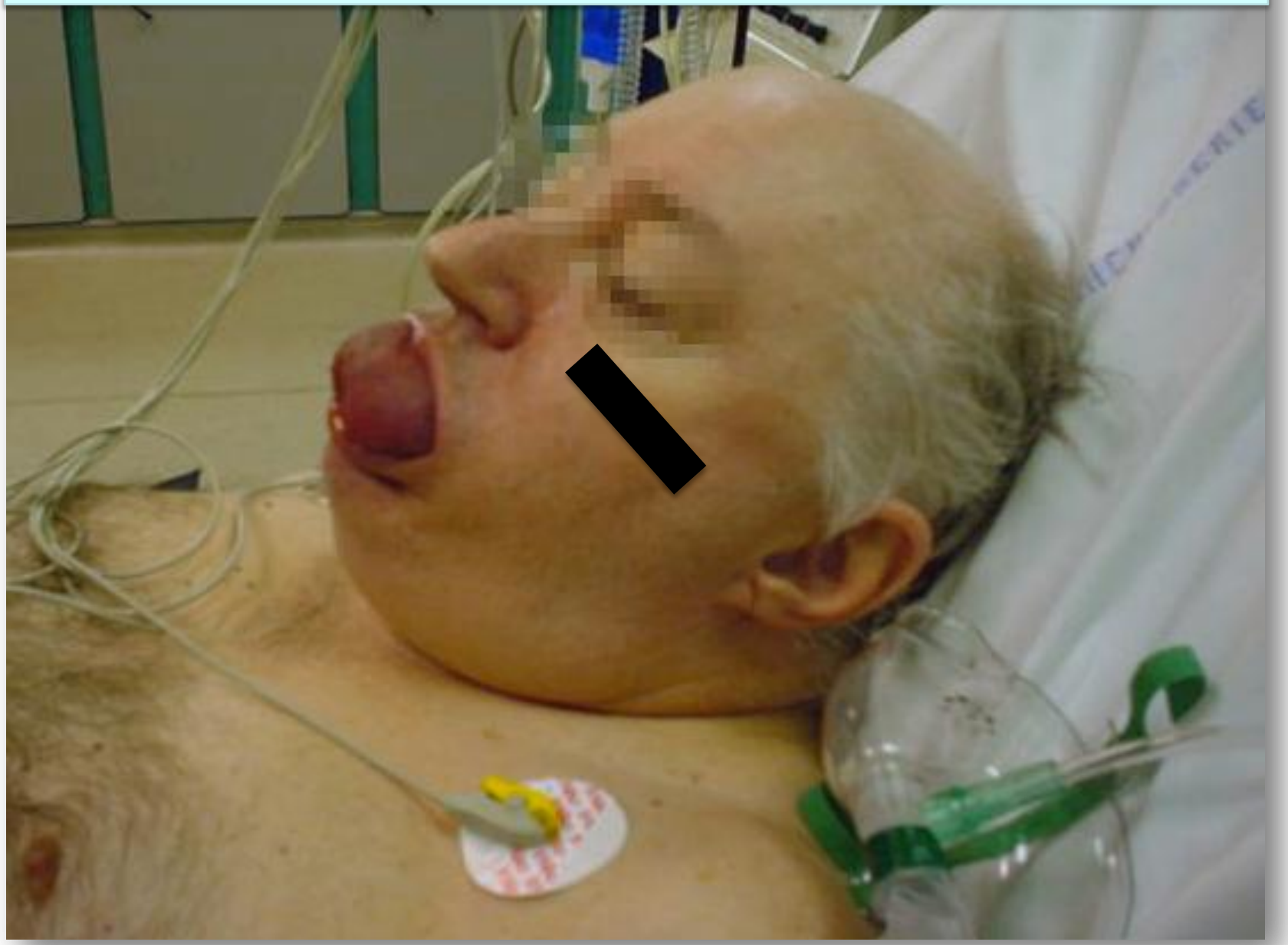
Objectives

1. Background : 2 situations = planed and unplanned difficult ventilation/intubation

2. How to detect difficult ICU intubation ?

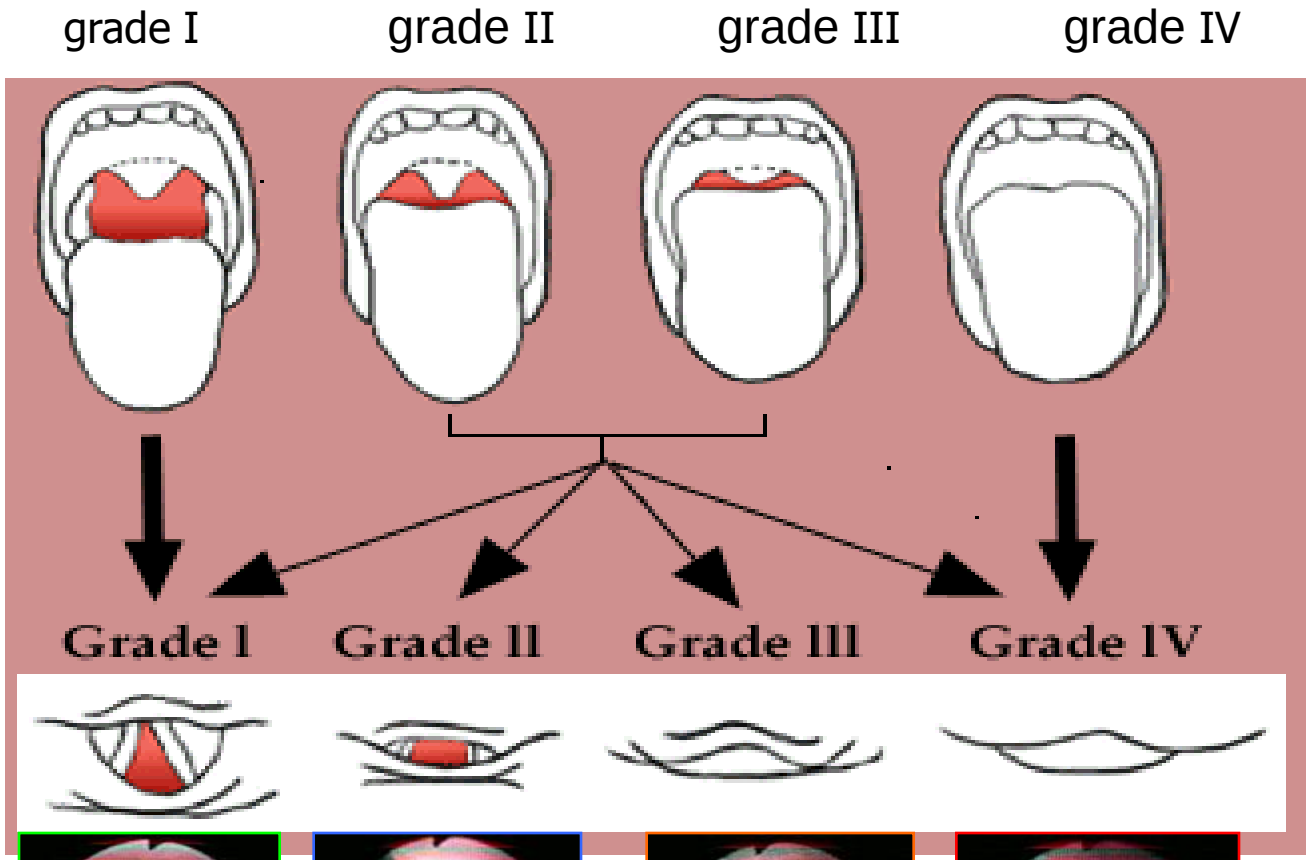
3. How to optimize difficult intubation procedure in ICU ?

PREDICTION of DIFFICULT INTUBATION



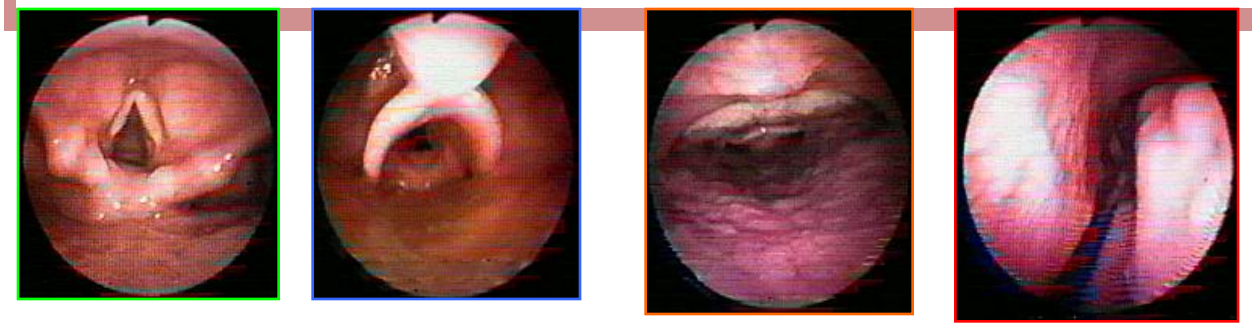
Morphologic criteria

Mallampati



Classification

Cormack And Lehane (larygoscopy)



Easy → *Intubation* → Difficult

Application in clinical practices

Evaluate « difficult » intubation criteria :

1. All non intubated patients in ICU : "difficult " ?

2. Patients at risk to be intubated = ex: under NIV ++

Could we better identified patients at risk of **difficult intubation**

?

Early Identification of Patients at Risk for Difficult Intubation in the Intensive Care Unit

Development and Validation of the MACOCHA Score in a Multicenter Cohort Study

Audrey De Jong[1], Nicolas Molinari[2], Nicolas Terzi[3], Nicolas Mongardon[4], Jean-Michel Arnal[5], Christophe Guitton[6], Bernard Allaouchiche[7], Catherine Paugam-Burtz[8,9], Jean-Michel Constantin[10], Jean-Yves Lefrant[11], Marc Leone[12], Laurent Papazian[13], Karim Asehnoune[14], Nicolas Maziers[15], Elie Azoulay[15], Gael Pradel[16], Boris Jung[1,17], Samir Jaber[1,17], Am J Respir Crit Care Med Apr 15, 2013

MACOCHA SCORE CALCULATION WORKSHEET

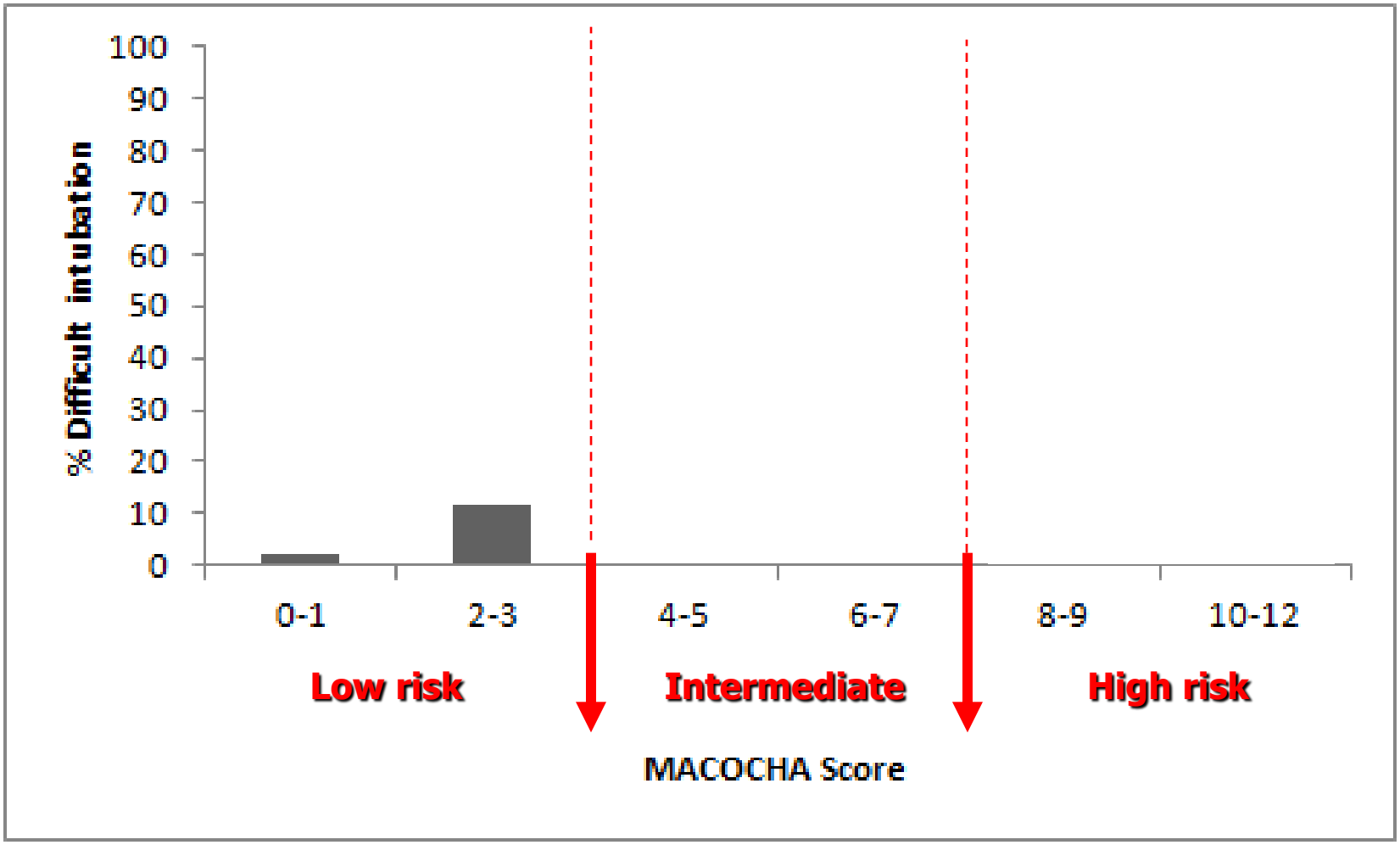
Factors	Points
Factors related to patient	
Mallampati score III or IV	5
Obstructive sleep apnea syndrome	2
Reduced mobility of cervical spine	1
Limited mouth opening <3 cm	1
Factors related to pathology	
Coma	1
Severe hypoxemia (<80%)	1
Factor related to operator	
Nonanesthesiologist	1
Total	12

MACOCHA SCORE

M. Mallampati score III or IV
A. Apnea Syndrom (obstructive)
C. Cervical spine limitation
O. Opening mouth <3cm
C. Coma
H. Hypoxia
A. Anesthesiologist Non training

	Points
Factors related to patient	
Factors related to pathology	
Factor related to operator	
Total	**12**

This score not only considers patient-related anatomical difficulty but also physiological factors and operator experience.



Frequency of difficult intubation with different MACOCHA Score

British Journal of Anaesthesia Page 1 of 10
doi:10.1093/bja/aeu373

BJA

Difficult intubation in obese patients: incidence, risk factors, and complications in the operating theatre and in intensive care units

A. De Jong[1], N. Molinari[2], Y. Pouzeratte[1], D. Verzilli[1], G. Chanques[1], B. Jung[1,3], E. Futier[1], P.-F. Perrigault[6], P. Colson[4], X. Capdevila[5] and S. Jaber[1,3*]

Risk Factors difficult intubation obese patients

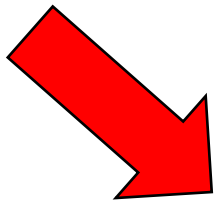


Table 3 Results of multivariate mixed effects regression for final difficult intubation prediction model from the ICU cohort in obese patients ($n=210$). Centre variable was entered as a random effect. OR, odds ratio; CI, confidence interval. Reference: Mallampati score=I or II; obstructive sleep apnoea syndrome=no; reduced mobility of cervical spine=no; limited mouth opening=no; severe hypoxaemia (<80%)=no; coma=no

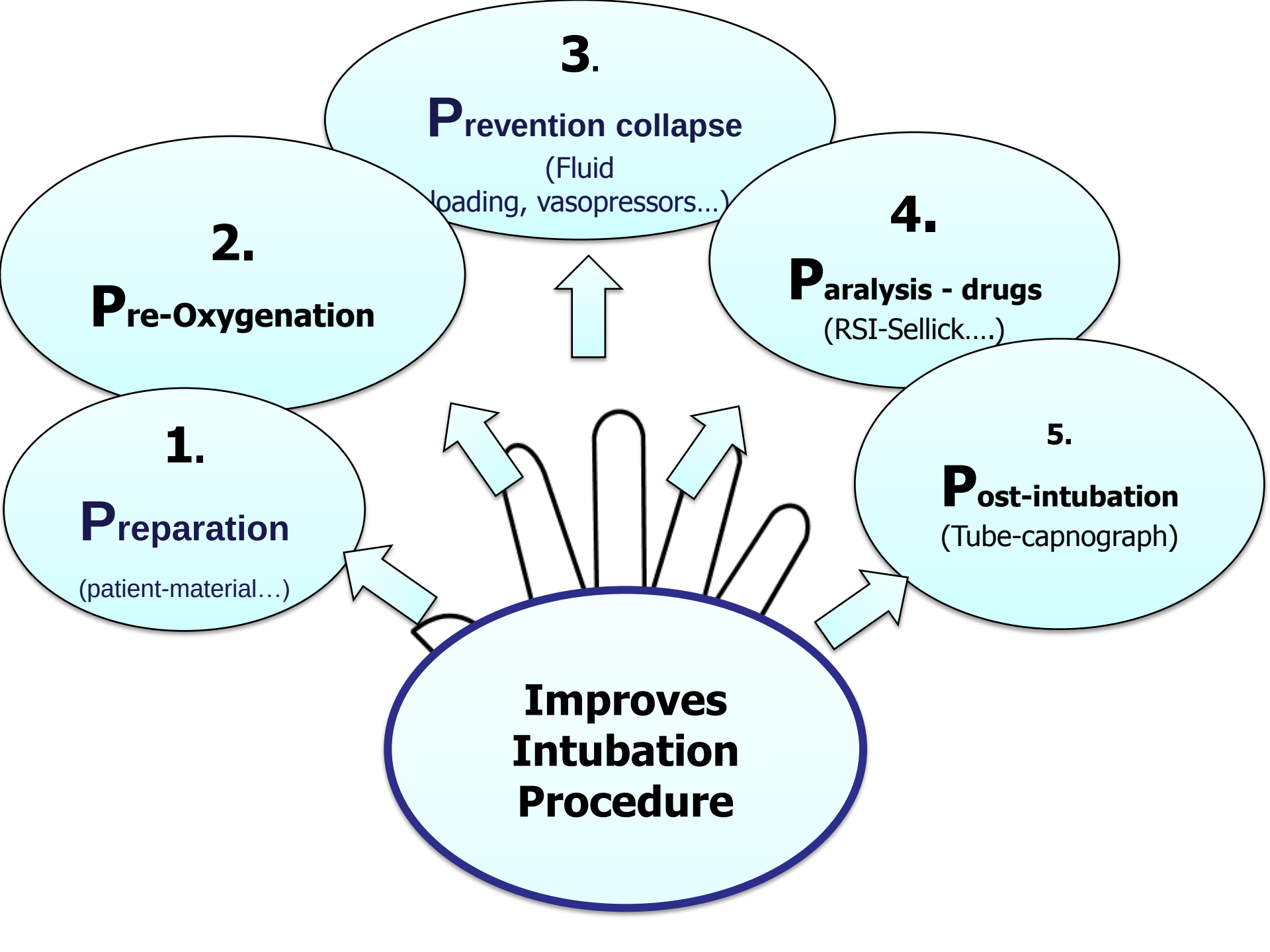
	OR	95% CI	*P*-value
Mallampati score III or IV	14.10	5.11–38.90	<0.0001
Obstructive sleep apnoea syndrome	2.90	1.04–8.07	0.04
Reduced mobility of cervical spine	2.75	0.83–9.12	0.09
Limited mouth opening	4.18	0.89–19.72	0.07
Severe hypoxaemia (<80%)	3.26	1.02–10.3	0.05
Coma	3.13	1.08–9.11	0.04

Objectives

1. Background : 2 situations = planed and unplanned difficult ventilation/intubation

2. How to detect difficult ICU intubation ?

3. How to optimize difficult intubation procedure in patients at risk ?

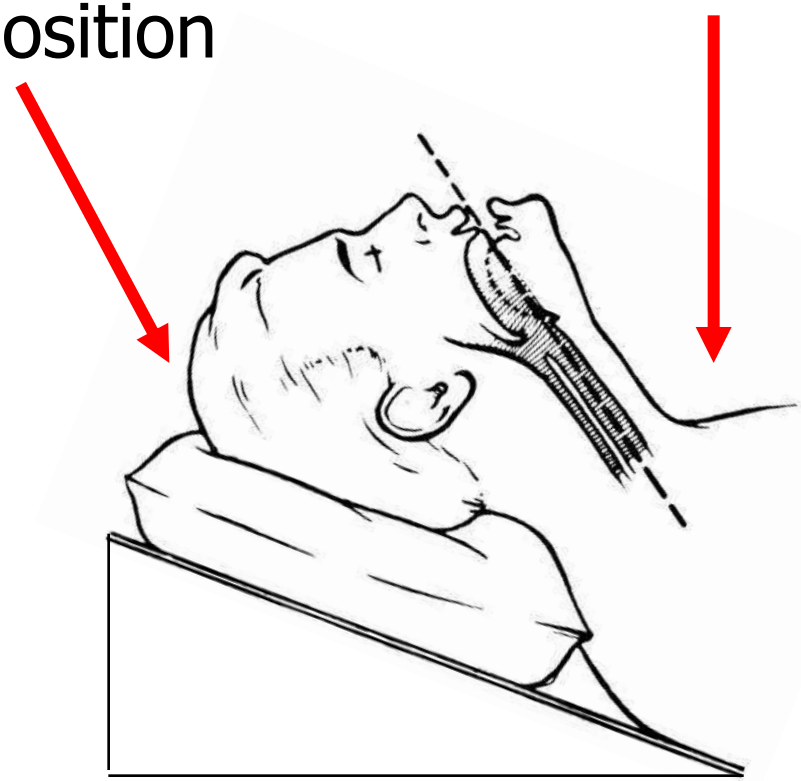

3.
Prevention collapse
(Fluid
loading, vasopressors…)
2.
Pre-Oxygenation
4.
Paralysis - drugs
(RSI-Sellick….)
1.
Preparation
(patient-material…)
5.
Post-intubation
(Tube-capnograph)
Improves
Intubation
Procedure

How to improve intubation procedure ?
"5 main Practices" (5-P)

1. Preparation (patient-material…)
2. Pre-Oxygenation
3. Prevention collapse (Fluid loading and vasopressors)
4. Paralysis (RSI, Sellick…) – Drugs
5. Post-Intubation (tube-Capnogram…)

Preparation

1. Patient : - Monitorage (scope ECG, SpO2, PA…)
   - venous perfusion.
   - Remove prostheses
   - Moderate Proclive Positon (if possible ?)
   - head-up position

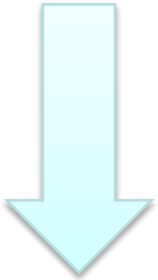


2. Nurses

3. Material

4. Drugs

Risk Factors for difficult intubation



Operator ?

Multivariate logistic regression analysis to assess independent risk factors for development of ETI complications

Predictive risk factor	*Odds ratio*	*95% Confidence interval*	
Acute respiratory failure	*3.04*	*1.08*	*8.75*
Lowest systolic blood pressure	*0.98*	*0.98*	*0.99*
Junior operator (= presence of 2 operators)	*0.42*	*0.22*	*0.78*

The only protective factor was the presence of two experienced airway physicians.

Jaber et al. Crit Care Med 2006

Anesthesiology 2008; 109:973–7

Effects of Supervision by Attending Anesthesiologists on Complications of Emergency Tracheal Intubation

Ulrich H. Schmidt, M.D., Ph.D., Kanya Kumwilaisak, M.D.,† Edward Bittner, M.D., Ph.D.,‡ Edward George, M.D., Ph.D.,‡ Dean Hess, Ph.D., R.R.T.§*

Complication	Attending Supervision, n = 115	No Supervision, n = 207	*P* Value
Overall	7 (6.1)	45 (21.7)	0.0001
Esophageal intubation	1 (0.9)	7 (3.4)	0.27
Traumatic intubation	2 (1.7)	14 (6.8)	0.06
Aspiration	1 (0.9)	12 (5.8)	0.037
Dental injury	0	2 (1.0)	0.54
Endobronchial intubation	3 (2.6)	15 (7.2)	0.13

Conclusion: **Supervision by an attending anesthesiologist was associated with a decreased incidence of complications during emergent intubations.**

Preparation

2. Personnel :

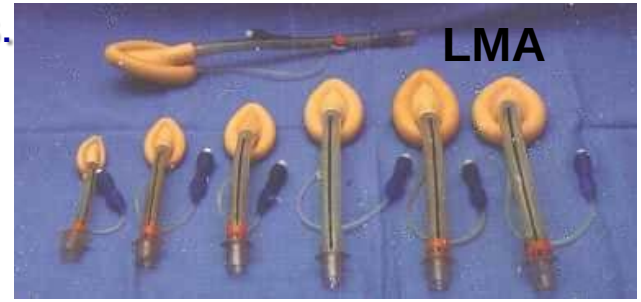
3. Material : dedicated trolley

- Written protocol for homogeneous practices
- Specific education for the staff (senior, junior physicians, nurses)
- Aspiration, water-set,
- Material for DIFFICULT INTUBATION

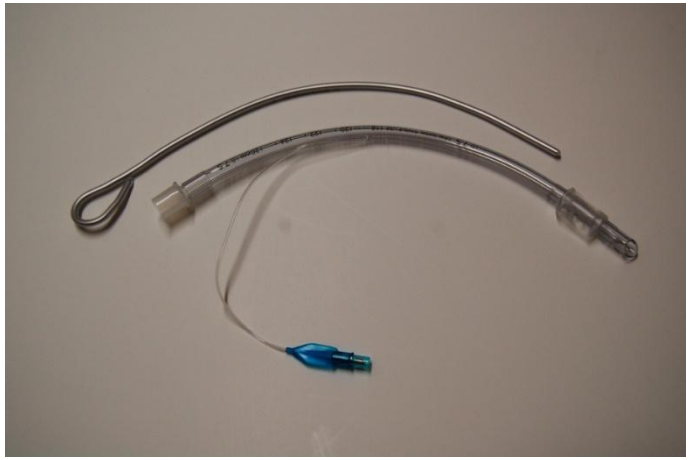
tested laryngoscopes, Several blades of laryngoscope, mandrin,…)

- Several tube sizes (woman 7-7.5 , man 8.0–8.5)
- Difficult intubation trolley (dedicated for ICU)
- Fastrach LMA (routine use), Bougies and stylet
- Videolaryngoscope
- Fiberoscopy (by training physician if multiple attempts.
- Capnogram monitoring

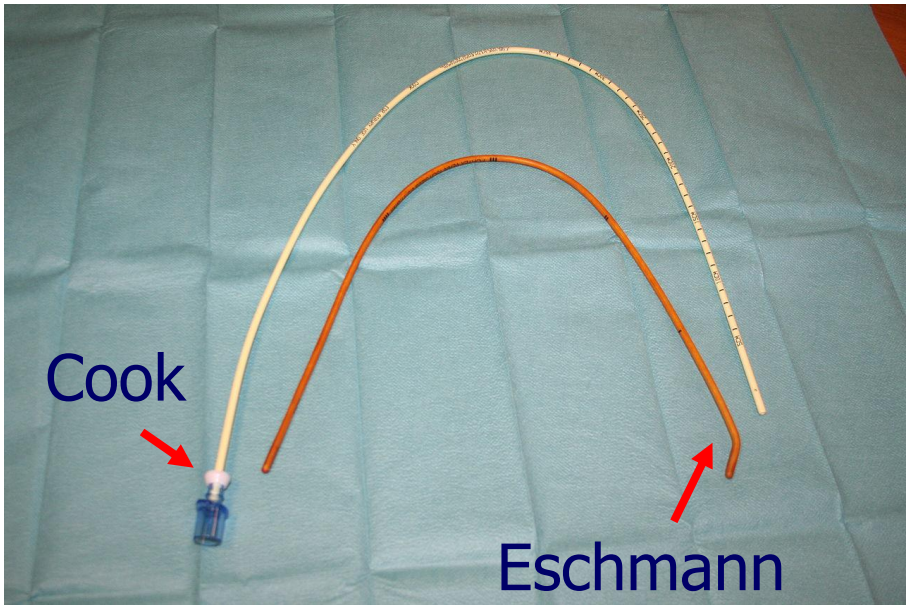
4. Drugs



Stylets



Mandrins



Audrey De Jong
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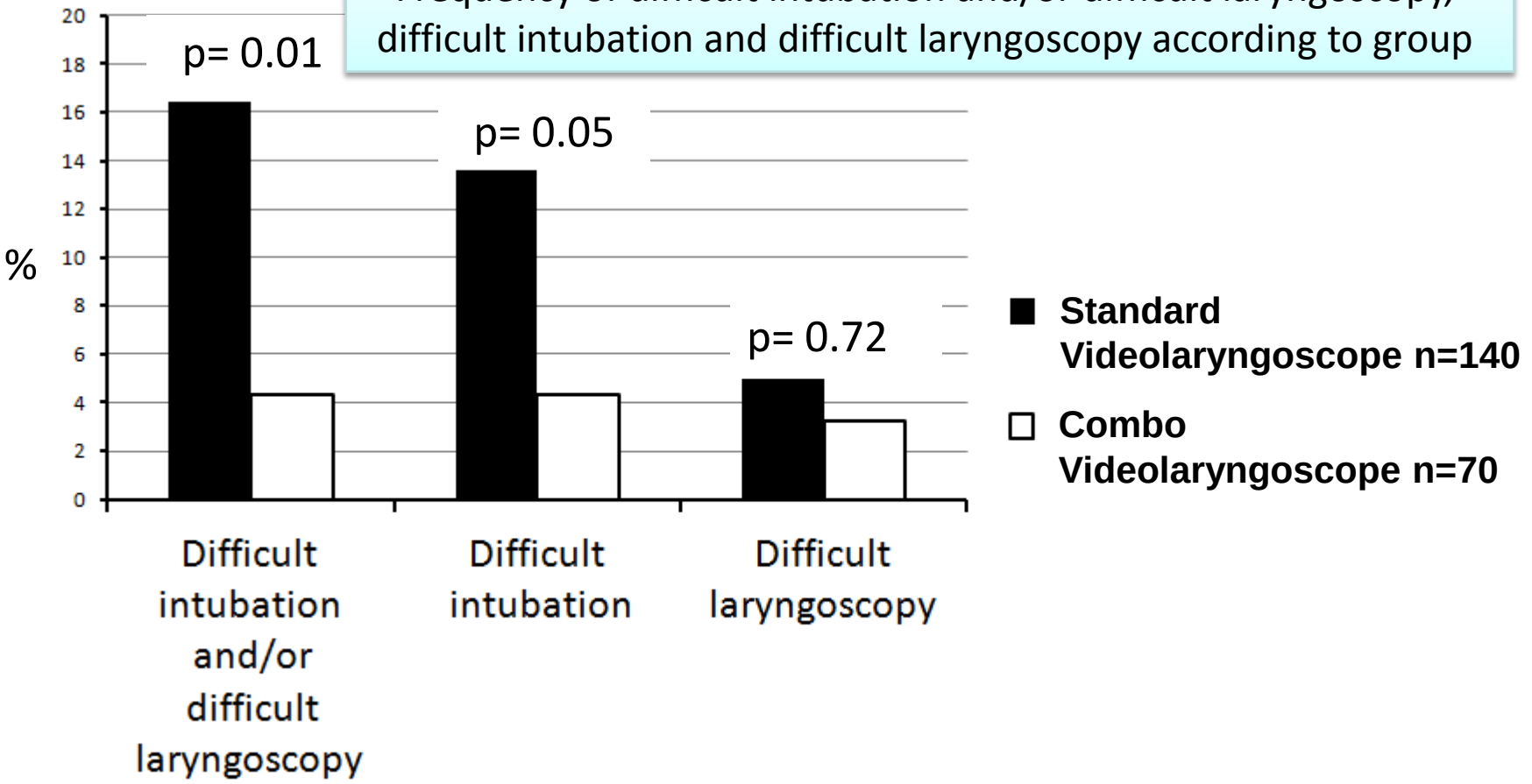
Yvan Pouzeratte
Moussa Cisse
Fouad Belafia
Boris Jung
Gérald Chanques
Nicolas Molinari
Samir Jaber

ORIGINAL

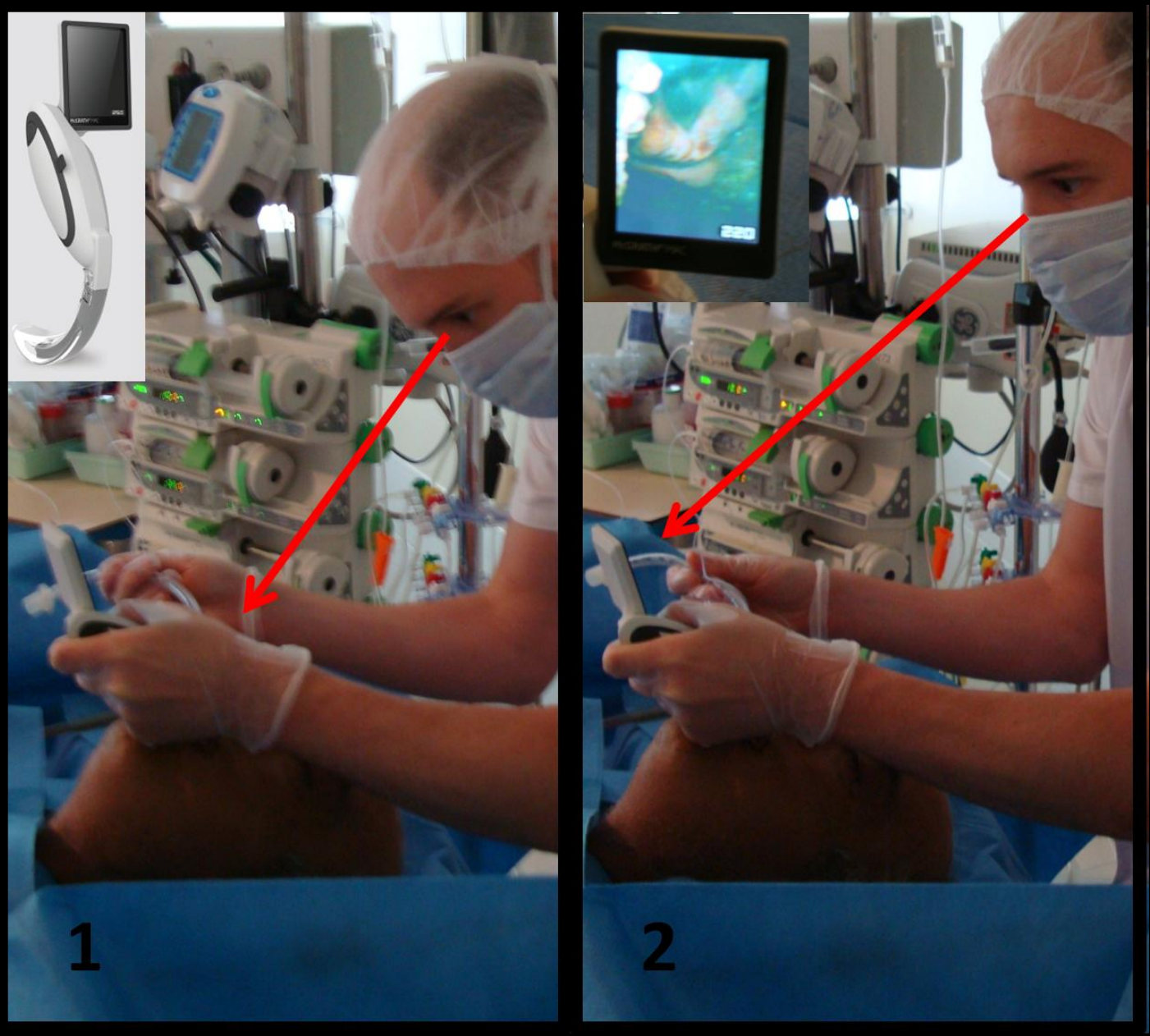
Implementation of a combo videolaryngoscope for intubation in critically ill patients: a before–after comparative study

Dec 2013

Frequency of difficult intubation and/or difficult laryngoscopy, difficult intubation and difficult laryngoscopy according to group



The two different ways of using the (combo) videolaryngoscope



Intensive Care Med
DOI 10.1007/s00134-014-3236-5

ORIGINAL

March 2014

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Video laryngoscopy versus direct laryngoscopy for orotracheal intubation in the intensive care unit: a systematic review and meta-analysis

1. Less Frequency of difficult intubation

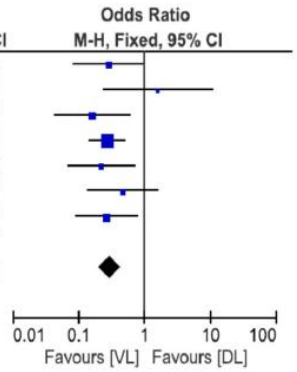
2. More Frequency of first attempt success

3. Less Frequency of Esophageal intubation

Study or Subgroup	Video Laryngoscope Events	Total	Direct Laryngoscope Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI
De Jong 2013	3	70	19	140	12.9%	0.29 [0.08, 1.00]
Griesdale 2012	3	20	2	20	1.8%	1.59 [0.24, 10.70]
Kory 2013	3	78	10	50	12.5%	0.16 [0.04, 0.61]
Lakticova 2013	18	252	31	140	39.3%	0.27 [0.14, 0.50]
Mosier 2013	6	234	6	56	10.0%	0.22 [0.07, 0.71]
Noppens 2012	4	117	8	113	8.4%	0.46 [0.14, 1.59]
Silverberg 2013	5	57	16	60	15.1%	0.26 [0.09, 0.78]
Total (95% CI)		**828**		**579**	**100.0%**	**0.29 [0.20, 0.44]**
Total events	42		92			

Heterogeneity: Chi² = 4.66, df = 6 (P = 0.59); I² = 0%
Test for overall effect: Z = 6.05 (P < 0.00001)

M-H = Mantel-Haenszel



JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Video Laryngoscopy vs Direct Laryngoscopy on Successful First-Pass Orotracheal Intubation Among ICU Patients

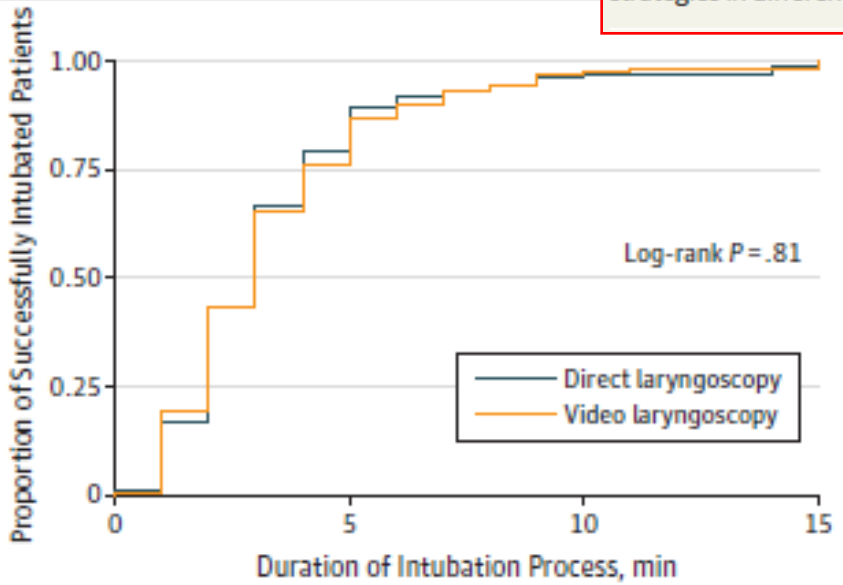
A Randomized Clinical Trial

JAMA. 2017;317(5):483-493.

Jean Baptiste Lascarrou, MD; Julie Boisrame-Helms, MD, PhD; Arthur Bailly, MD; Aurelie Le Thuaut, MSc; Toufik Kamel, MD; Emmanuelle Mercier, MD; Jean-Damien Ricard, MD, PhD; Virginie Lemiale, MD; Gwenhael Colin, MD; Jean Paul Mira, MD, PhD; Ferhat Meziani, MD, PhD; Jonathan Messika, MD; Pierre Francois Dequin, MD, PhD; Thierry Boulain, MD; Elie Azoulay, MD, PhD; Benoit Champigneulle, MD; Jean Reignier, MD, PhD; for the Clinical Research in Intensive Care and Sepsis (CRICS) Group

CONCLUSIONS AND RELEVANCE Among patients in the ICU requiring intubation, video laryngoscopy compared with direct laryngoscopy did not improve first-pass orotracheal intubation rates and was associated with higher rates of severe life-threatening complications. Further studies are needed to assess the comparative effectiveness of these 2 strategies in different clinical settings and among operators with diverse skill levels.

Figure 2. Proportion of Patients Successfully Intubated According to Duration of the Intubation Procedure



No. at risk				
Direct laryngoscopy	181	37	7	2
Video laryngoscopy	181	43	5	3

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

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Type of complication	Video Laryngoscopy	Direct Laryngoscopy		
Death	1/184 (0.5)	0/181	0.5 (−0.5 to 1.6)	.99
Cardiac arrest	4/184 (2.2)	0/181	2.2 (0.07 to 4.3)	.12
Arrhythmia	3/184 (1.6)	4/181 (2.2)	−0.6 (−3.4 to 2.2)	.69
Esophageal intubation	3/184 (1.6)	6/181 (3.3)	−1.7 (−4.9 to 1.5)	.33
Aspiration	4/184 (2.2)	4/181 (2.2)	0 (−3.0 to 3.0)	.99
Tooth injury	0/184	1/181 (0.6)	−0.6 (−1.6 to 0.5)	.50
Hypoxemia[i]	14/173 (8.1)	19/174 (10.9)	−2.8 (−9.0 to 3.3)	.37
Severe hypoxemia[j]	6/176 (3.4)	1/181 (0.5)	2.9 (−0.03 to 5.7)	.06
Hypotension[k]	8/180 (4.4)	4/179 (2.2)	2.2 (−1.5 to 5.9)	.24
≥1 Life-threatening complication	24/180 (13.3)	17/179 (9.5)	3.8 (−2.7 to 10.4)	.25
Type of life-threatening complication[l]				
Mild to moderate[m]	10/181 (5.4)	14/181 (7.7)	−2.3 (−7.4 to 2.8)	.37
Severe[n]	17/179 (9.5)	5/179 (2.8)	6.7 (1.8 to 11.6)	.01

Video Laryngoscopy for Endotracheal Intubation of Critically Ill Adults

A Systemic Review and Meta-Analysis

Hui-Bin Huang, MD; Jin-Min Peng, MD; Biao Xu, MD; Guang-Yun Liu, MD; and Bin Du, MD

CHEST 2017; 152(3):510-517

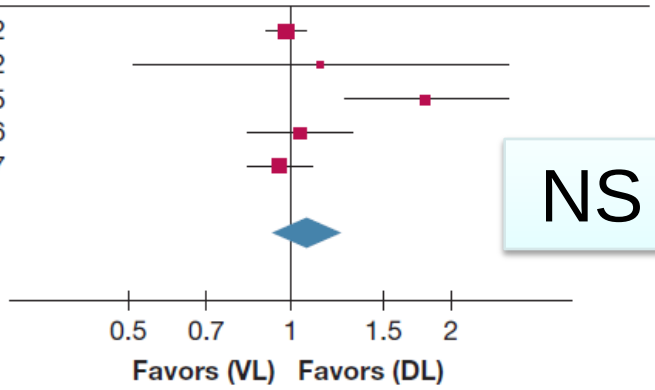
Primary outcome = First-attempt success rate

A

Study or Subgroup	VL Events	VL Total	DL Events	DL Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Yeatts et al[12]/2013	242	303	259	320	34.1%	0.99 (0.91-1.07)	2012
Griesdale et al[8]/2012	8	20	7	20	3.3%	1.14 (0.51-2.55)	2012
Silverberg et al[7]/2015	41	57	24	60	12.7%	1.80 (1.27-2.55)	2015
Janz et al[13]/2016	51	74	50	76	20.9%	1.05 (0.84-1.31)	2016
Lascarrou et al[17]/2017	126	186	130	185	28.9%	0.96 (0.84-1.10)	2017
Total (95% CI)		**640**		**661**	**100.0%**	**1.08 (0.92-1.26)**	
Total events	468		470				

Heterogeneity: $Tau^2 = 0.02$; $\chi^2 = 11.93$, df = 4 ($P = .02$); $I^2 = 66\%$

Test for overall effect: $z = 0.94$ ($P = .35$)



NS

CONCLUSIONS: The VL technique did not increase the first-attempt success rate during EI in ICU patients compared with DL. These findings do not support routine use of VL in ICU

Video Laryngoscopy for Endotracheal Intubation of Critically Ill Adults

A Systemic Review and Meta-Analysis

Hui-Bin Huang, MD; Jin-Min Peng, MD; Biao Xu, MD; Guang-Yun Liu, MD; and Bin Du, MD

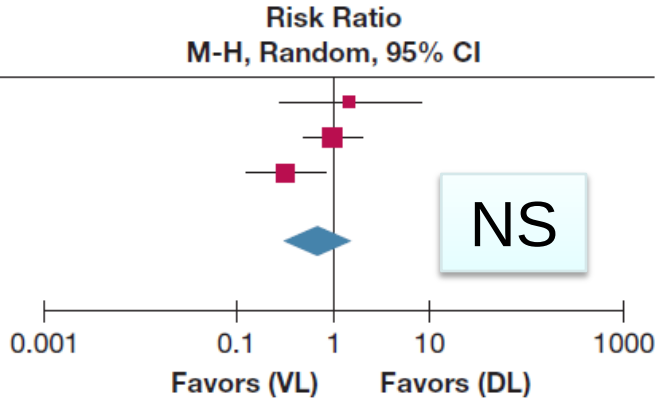
CHEST 2017; 152(3):510-517

Secondary outcome = Difficult intubation

E

Study or Subgroup	VL Events	VL Total	DL Events	DL Total	Weight	Risk Ratio M-H, Random, 95% CI
Griesdale et al[8]/2012	3	20	2	20	18.7%	1.50 (0.28-8.04)
Lascarrou et al[17]/2017	14	186	14	185	44.7%	0.99 (0.49-2.03)
Silverberg et al[7]/2015	5	57	16	60	36.6%	0.33 (0.13-0.84)
Total (95% CI)		**263**		**265**	**100.0%**	**0.72 (0.30-1.70)**
Total events	22		32			

Heterogeneity: Tau^2 = 0.30; χ^2 = 4.23, df = 2 (P = .12); I^2 = 53%
Test for overall effect: z = 0.76 (P = .45)



1. The creation of a “blind spot” under Videolaryngoscope has been proposed as a major contributor to intubation failure and pharyngeal soft tissue injury.

2. Level of expertise and experience of operator

Intubation et obésité

- Présumée difficile
- Préparation ++++, algorithme
- Vidéolaryngoscope si difficile
- Intubation séquence rapide si estomac plein

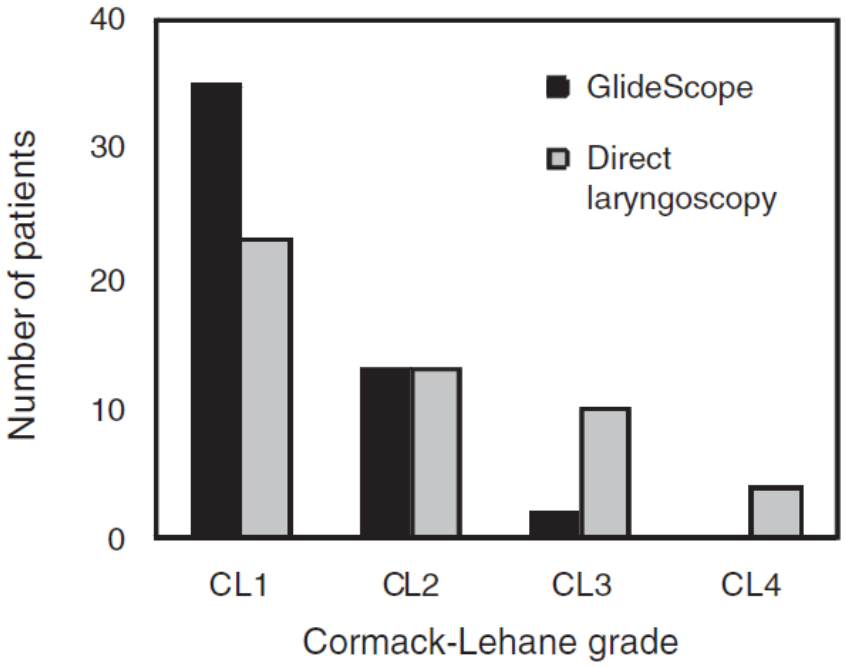


Fig. 3. Cormack–Lehane grades in morbidly obese patients intubated with either the GlideScope videolaryngoscope or the Macintosh direct laryngoscope (P = 0.003).

VIDEO LARYNGOSCOPE

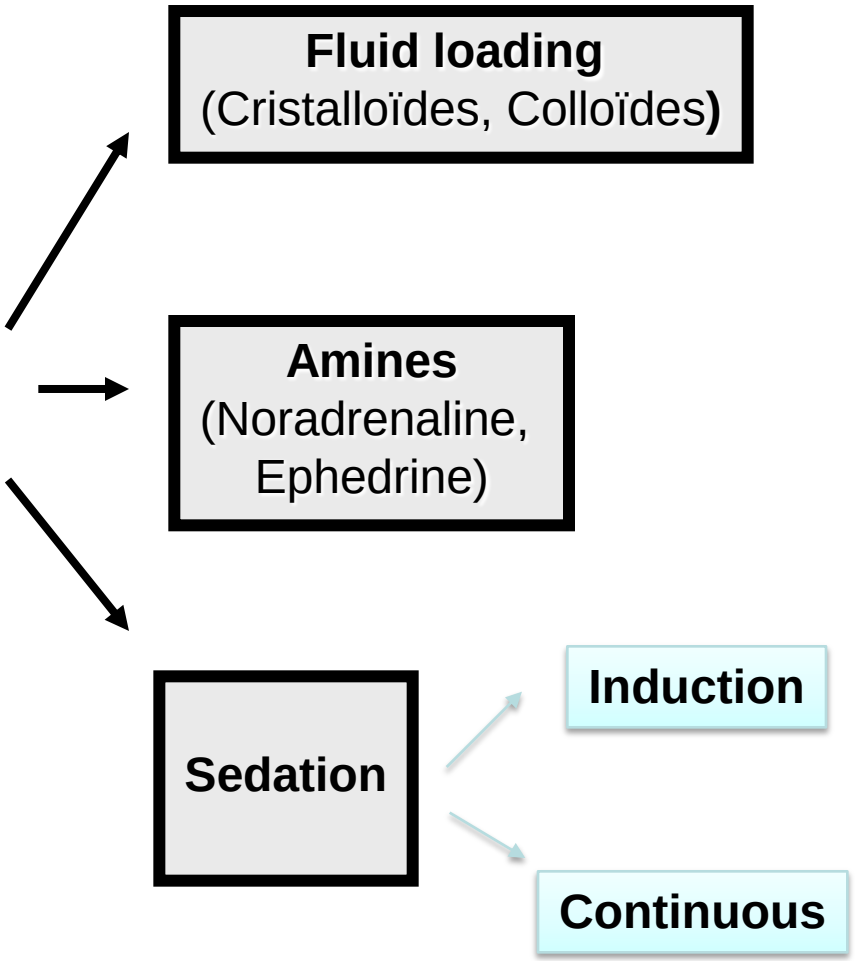
↓ INTUBATION DIFFICILE

Andersen et al., Acta Anaesthesiologica Scandinava 2011

Preparation

1. Patient
2. Personnel :
3. Material

4. Drugs



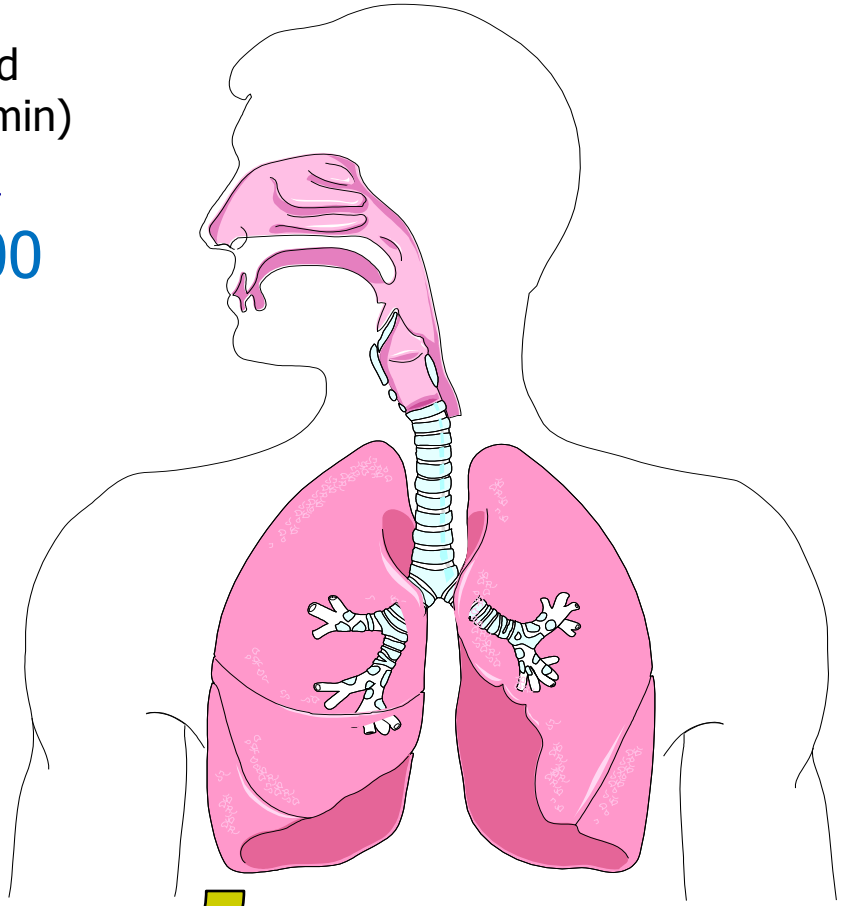
How to improve intubation procedure ?
"5 main Practices"

1. **Preparation** (patient-material…)
2. **Pre-Oxygenation**
3. **Prevention collapse** (Fluid loading and vasopressors)
4. **Paralysis** (RSI, Sellick…) – **Drugs**
5. **Post-Intubation** (tube-Capnogram…)

Preoxygenation/Denitrogenation

	Before preoxygenation	End (3-4 min)
PaO2 (mmHg)	100	400

Healthy lungs



Preoxygenation/Denitrogenation

Before preoxygenation

End (3-4 min)

PaO2 (mmHg)

100 ⇨ 400

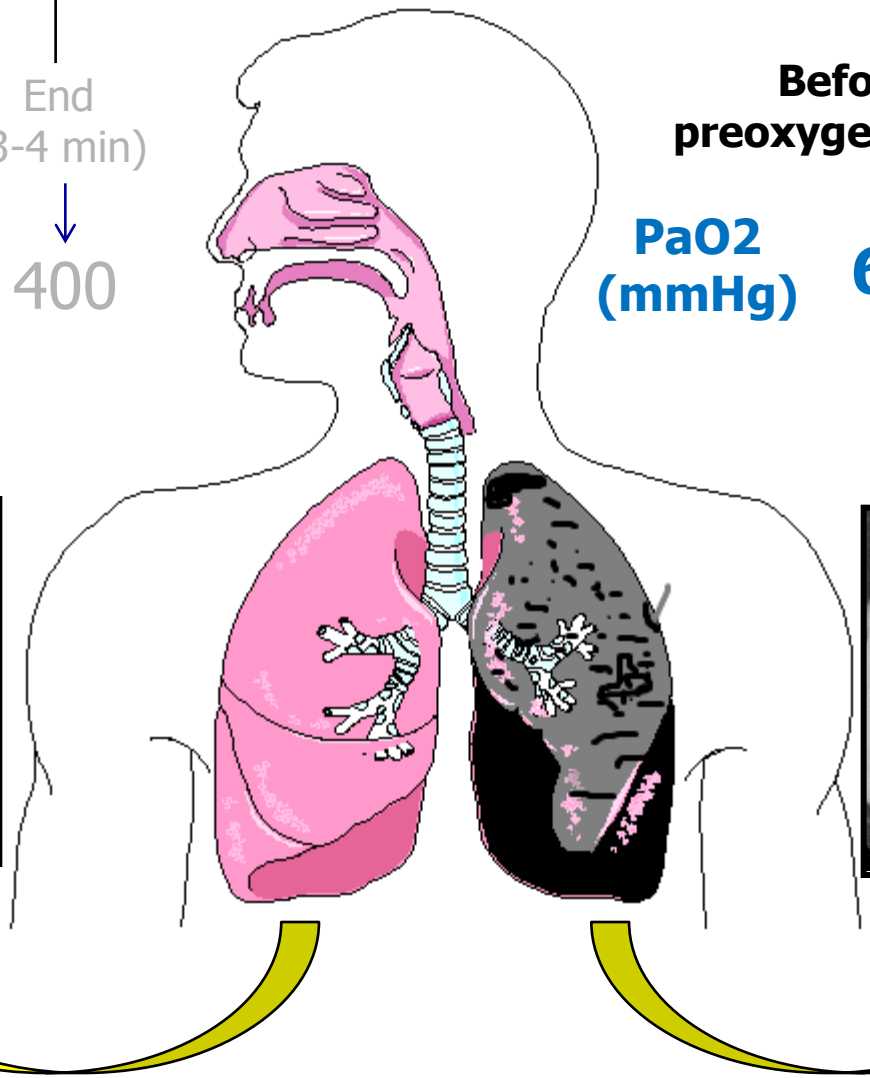
Before preoxygenation

End (3-4 min)

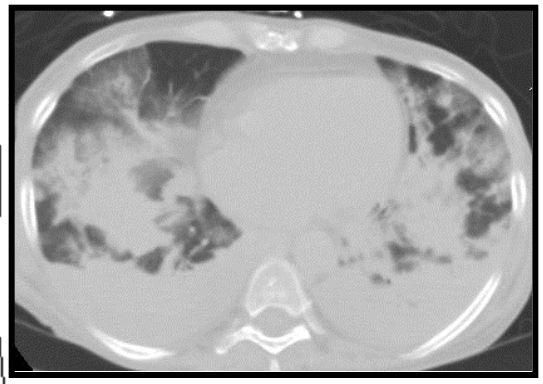
PaO2 (mmHg)

60 ➡ 100

Healthy lungs



Injured lungs

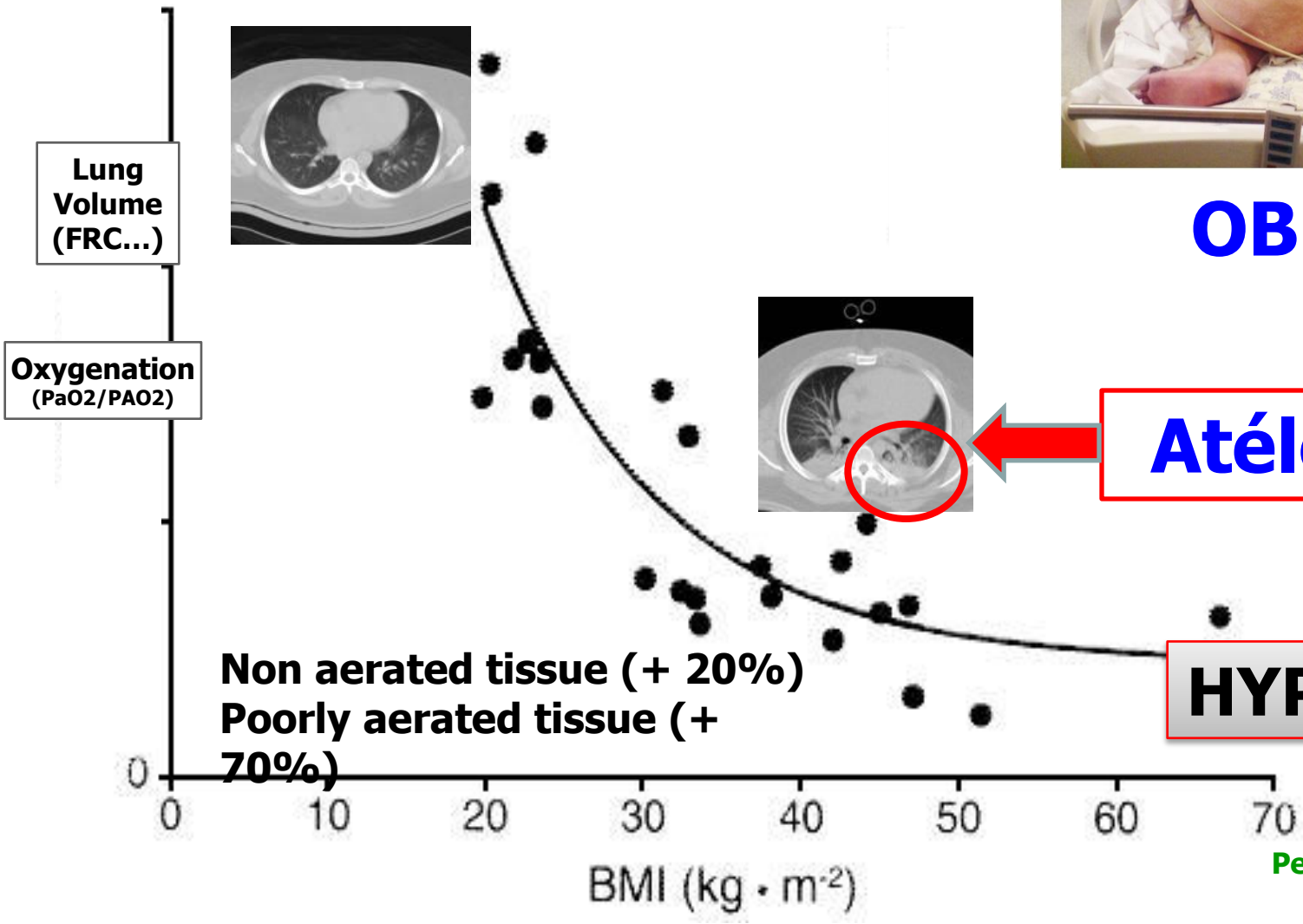


LUNG VOLUMES AND OXYGENATION

OBESITY

Atélectasis

HYPOXEMIA

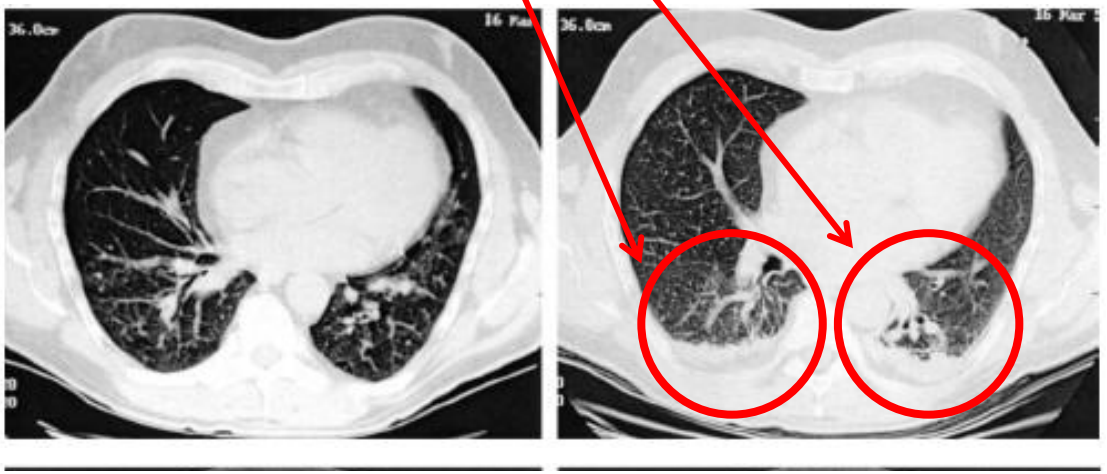


Pelosi Anesth Analg 1998

Prevention of derecruitment (atelectasis) during intubation

Standard Preoxygenation

Atelectasis +



Rusca. Anesth Analg 2003

Preoxygenation before intubation in ICU : new approaches ?

1. Non-Invasive Ventilation (NIV/CPAP)

2. High Flow Oxygen Cannula (HFNC)

3. Combined NIV + HFNC

Preoxygenation before intubation in ICU : new approaches ?

1. Non-Invasive Ventilation (NIV/CPAP)

2. High Flow Oxygen Cannula (HFNC)

3. Combined NIV + HFNC

Noninvasive Ventilation Improves Preoxygenation before Intubation of Hypoxic Patients

Christophe Baillard, Jean-Philippe Fosse, Mustapha Sebbane, Gérald Chanques, François Vincent, Patricia Courouble, Yves Cohen, Jean-Jacques Eledjam, Frédéric Adnet, and Samir Jaber

Am J Respir Crit Care Med Vol 174. pp 171–177, 2006

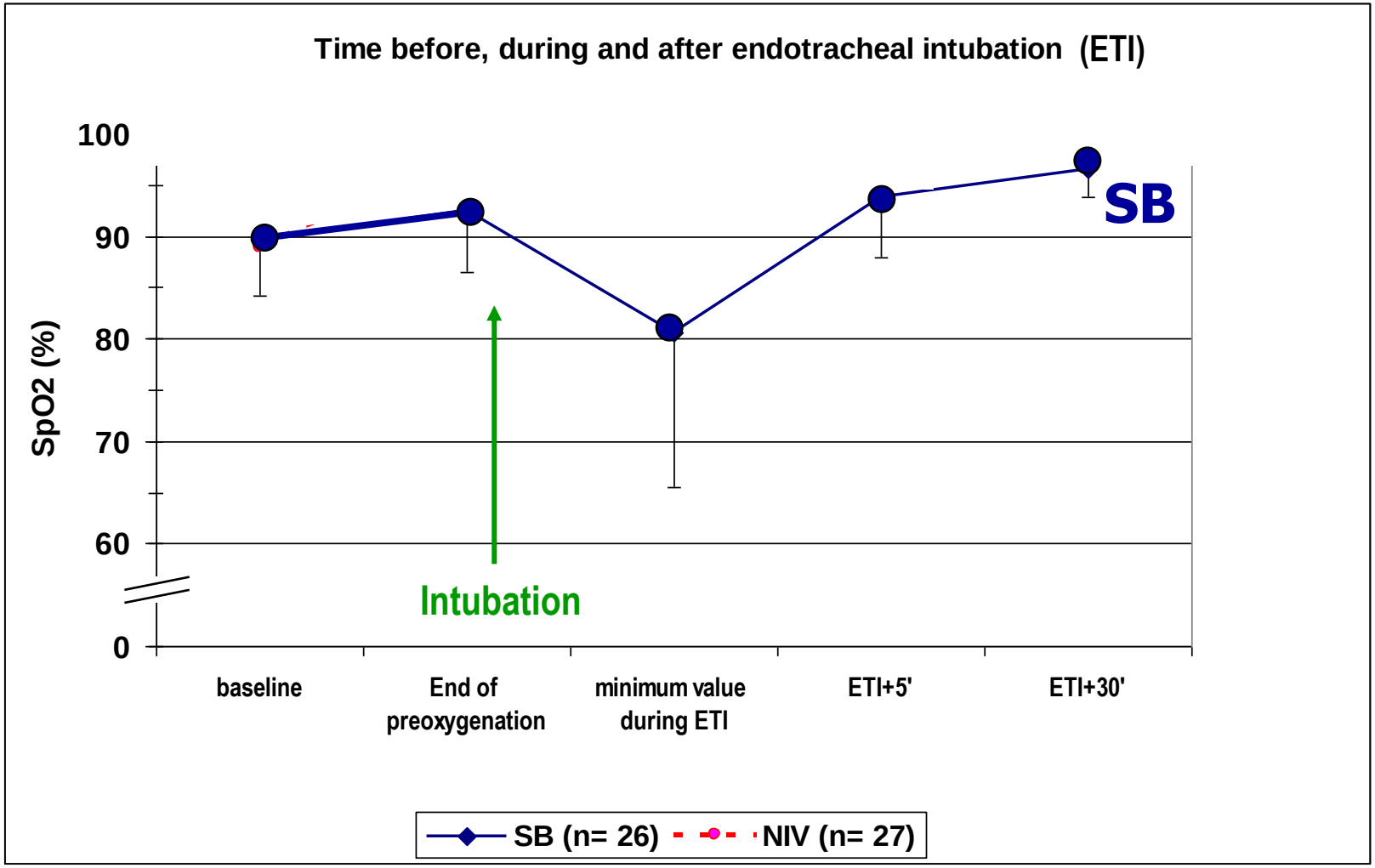
Standard (balloon) **versus** **NIV (PSV+PEEP)-preOxy**

FiO2 = 1
5 < PSV < 15 cmH2O
5< PEEP < 10 cmH2O

Noninvasive Ventilation Improves Preoxygenation before Intubation of Hypoxic Patients

Christophe Baillard, Jean-Philippe Fosse, Mustapha Sebbane, Gérald Chanques, François Vincent, Patricia Courouble, Yves Cohen, Jean-Jacques Eledjam, Frédéric Adnet, and Samir Jaber

Am J Respir Crit Care Med Vol 174. pp 171–177, 2006



NIV preoxygenation before intubation

OPERATING ROOM

Jean-Marc Delay, MD*
Mustapha Sebbane, MD*
Boris Jung, MD*
David Nocca, MD†
Daniel Verzilli, MD*
Yvan Pouzeratte, MD*
Moez El Kamel, MD*
Jean-Michel Fabre, MD, PhD†
Jean-Jacques Eledjam, MD, PhD*
Samir Jaber, MD, PhD*

The Effectiveness of Noninvasive Positive Pressure Ventilation to Enhance Preoxygenation in Morbidly Obese Patients: A Randomized Controlled Study

Anesth Analg 2008;107:1707–13

Jean-Marc Delay, MD*
Mustapha Sebbane, MD*
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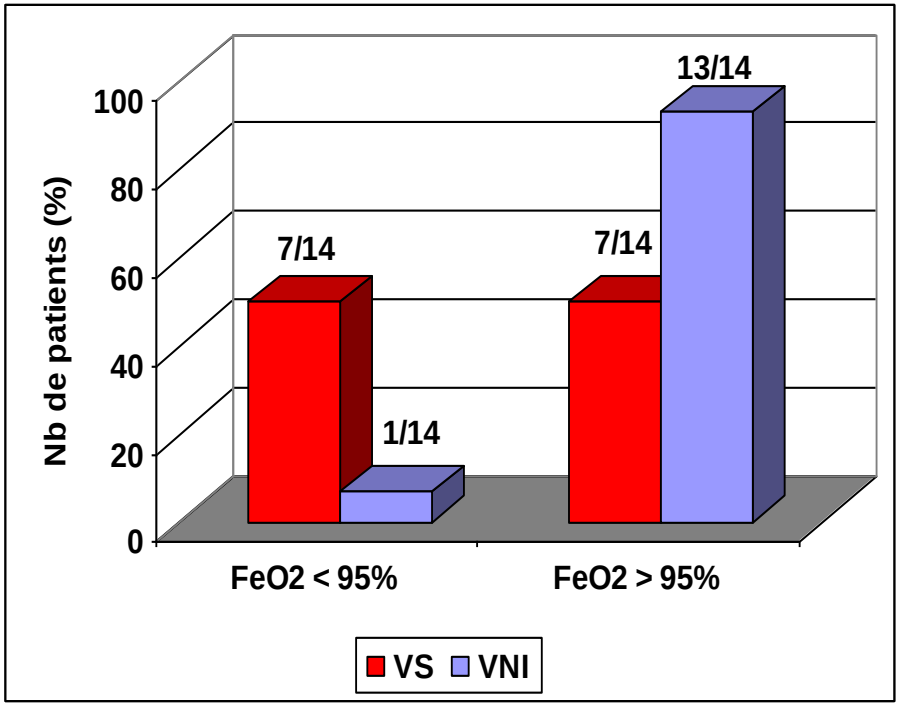
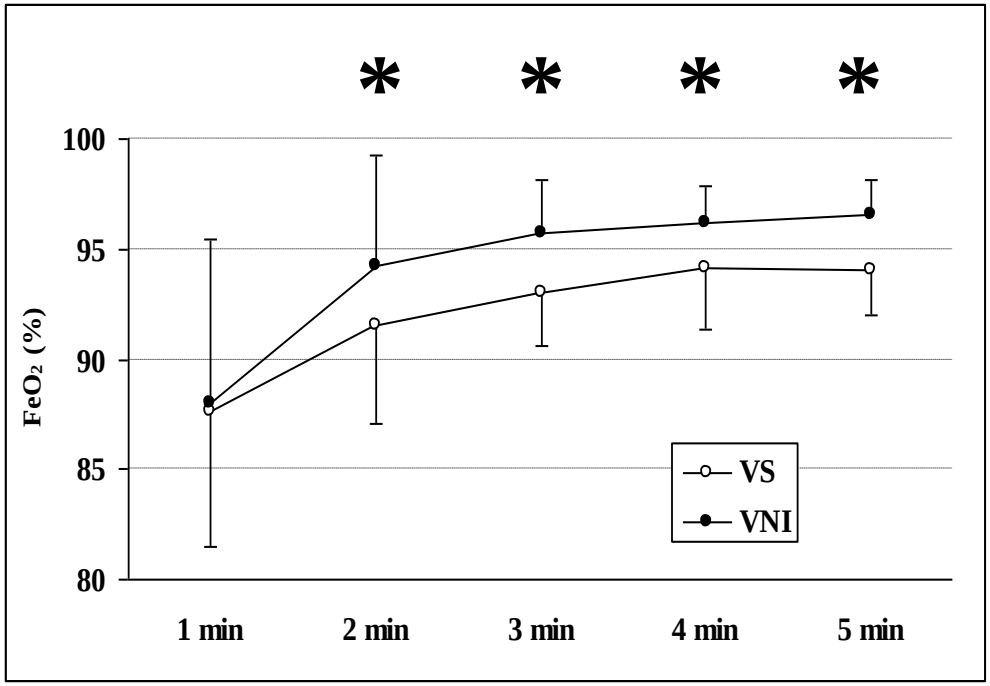
Samir Jaber, MD, PhD*

The Effectiveness of Noninvasive Positive Pressure Ventilation to Enhance Preoxygenation in Morbidly Obese Patients: A Randomized Controlled Study

Anesth Analg 2008;107:1707–13

NIV preoxygenation before intubation in OR



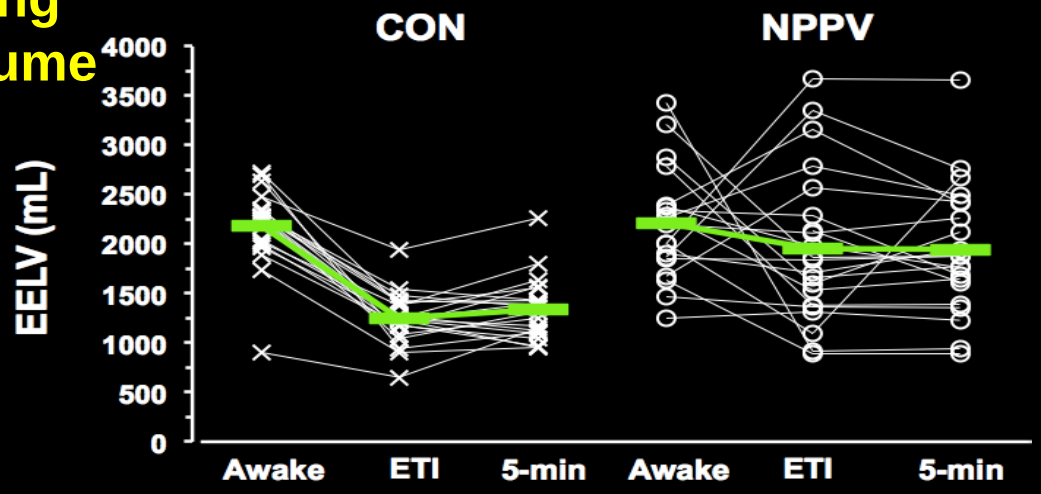


Face mask NIV with Pressure Support (8-10 cmH20) and PEEP (6 cmH20) improves preoxygenation in obese patients

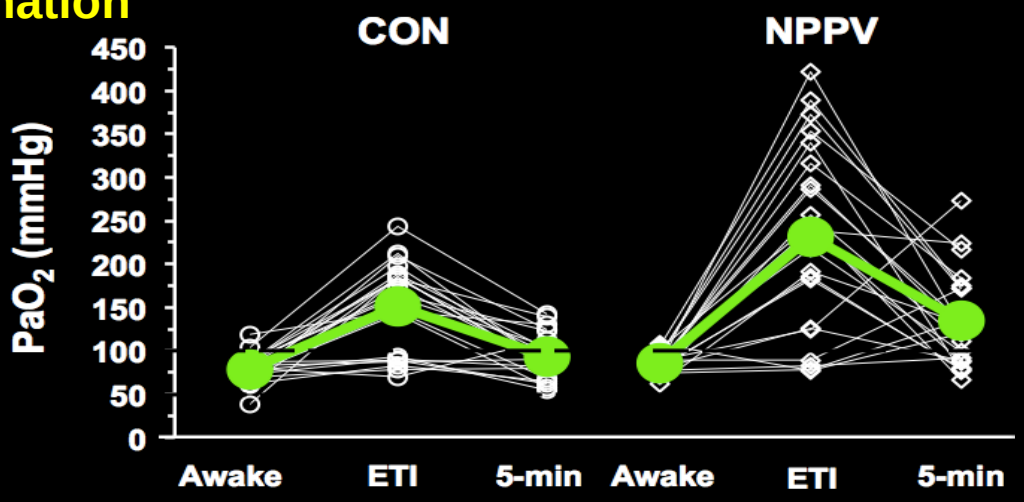
Noninvasive Ventilation and Alveolar Recruitment Maneuver Improve Respiratory Function during and after Intubation of Morbidly Obese Patients: A Randomized Controlled Study

Emmanuel Futier, Jean-Michel Constantin, Paolo Pelosi, Gerald Chanques, Alexandre Massone, Antoine Petit, Fabrice Kwiatkowski, Jean-Etienne Bazin, Samir Jaber

Lung Volume



Oxygenation



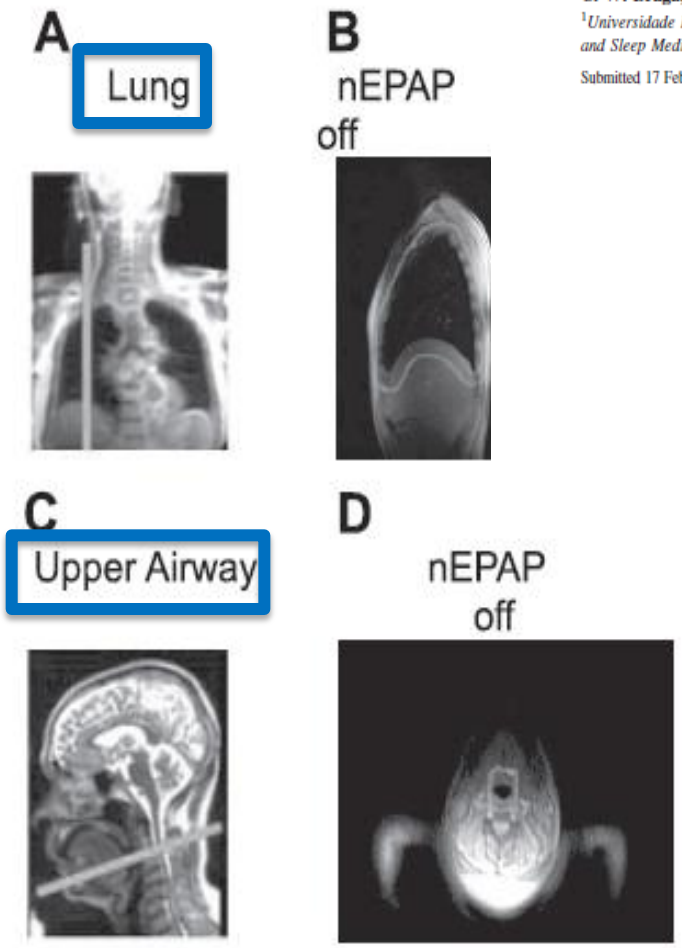
Anesthesiology 2011

J Appl Physiol 111: 1400–1409, 2011.
First published July 28, 2011; doi:10.1152/japplphysiol.00218.2011.

Changes in lung volume and upper airway using MRI during application of nasal expiratory positive airway pressure in patients with sleep-disordered breathing

C. W. Braga,[1] Q. Chen,[2] O. E. Burschtin,[2] D. M. Rapoport,[2] and I. Ayappa[2]
[1]*Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil; and* [2]*Division of Pulmonary, Critical Care, and Sleep Medicine, New York University School of Medicine, New York, New York*

Submitted 17 February 2011; accepted in final form 25 July 2011



Impact of PEEP on :

1. Lung

2. Upper Airway

Effect of preoxygenation using non-invasive ventilation before intubation on subsequent organ failures in hypoxaemic patients: a randomised clinical trial

British Journal of Anaesthesia, 2018 feb

C. Baillard[1,*], G. Prat[2], B. Jung[3], E. Futier[4], J. Y. Lefrant[5], F. Vincent[6], A. Hamdi[7], E. Vicaut[8] and S. Jaber[3]

Variables	Preoxygenation NIV n=99	Preoxygenation face mask n=102	P
Maximal SOFA value*	9 (6–12)	10 (6–12)	0.65
Number of organ failures:			
0	8 (8.2%)	3 (3.1%)	0.34
1	23 (23.5%)	27 (27.6%)	
2	34 (34.7%)	26 (26.5%)	
3	20 (20.4%)	26 (26.5%)	
4	9 (9.2%)	11 (11.2%)	
5	4 (4.1%)	5 (5.1%)	
Death†	31 (31.3%)	38 (37.3%)	0.76

Primary Endpoint = NS.

Conclusions: This study failed to demonstrate any benefits of using NIV as a preoxygenation method to reduce organ dysfunction compared with usual preoxygenation in hypoxaemic, critically ill patients requiring tracheal intubation for invasive ventilation. NIV should not be discontinued for preoxygenation in the cases of patients treated by NIV before the decision to intubate.

Effect of preoxygenation using non-invasive ventilation before intubation on subsequent organ failures in hypoxaemic patients: a randomised clinical trial

British Journal of Anaesthesia, 2018

C. Baillard[1,*], G. Prat[2], B. Jung[3], E. Futier[4], J. Y. Lefrant[5], F. Vincent[6], A. Hamdi[7], E. Vicaut[8] and S. Jaber[3]

Table 5 Adverse events in patients with non-invasive, NIV, respiratory support at the time of randomisation (prior to intervention), *n*=91. Data are presented as *n* (%) or median (interquartile). NIV, non-invasive ventilation; SOFA, sequential organ failure assessment score

Variables	Preoxygenation NIV *n*=45	Preoxygenation face mask *n*=46	OR	P
Patients with at least one adverse event during preoxygenation or intubation	8 (17.8%)	19 (41.3%)	5.2 (1.6–17)	0.006
SpO_2<80%	7 (16.6%)	19 (41.3%)		0.002
Arrhythmia with haemodynamic failure	0 (0%)	2 (4.3%)		
Regurgitation	0 (0%)	1 (2.2%)		
Myocardial ischaemia	1 (2.2%)	0 (0%)		
Preoxygenation failure	0 (0%)	5 (10.8%)		
Total number of adverse events	8	27		
Maximal SOFA value*	9.5 (6–13)	9.5 (7–12)		0.59
Number of organ failures:	2 (2–3)	2 (1–4)		0.68
0	1 (2.2%)	2 (4.3%)		
1	10 (22.2%)	10 (21.7%)		
2	15 (33.3%)	13 (28.3%)		
3	9 (20.0%)	8 (17.4%)		
4	6 (13.3%)	10 (21.7%)		
5	4 (8.9%)	3 (6.5%)		

Conclusions: This study failed to demonstrate any benefits of using NIV as a preoxygenation method to reduce organ dysfunction compared with usual preoxygenation in hypoxaemic, critically ill patients requiring tracheal intubation for invasive ventilation. NIV should not be discontinued for preoxygenation in the cases of patients treated by NIV before the decision to intubate.

Preoxygenation before intubation in ICU : new approaches ?

1. Non-Invasive Ventilation (NIV/CPAP)
2. **High Flow Oxygen Cannula (HFNC)**
3. Combined NIV + HFNC ?

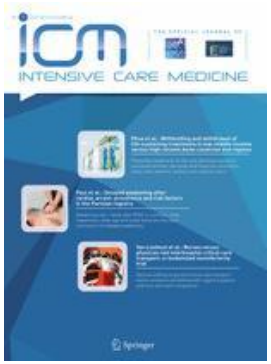
Use of High-Flow Nasal Cannula Oxygen Therapy to Prevent Desaturation During Tracheal Intubation of Intensive Care Patients With Mild-to-Moderate Hypoxemia

Romain Miguel-Montanes, MD[1]; David Hajage, MD[2]; Jonathan Messika, MD[1,3,4]; Fabrice Bertrand, MD[1]; Stéphane Gaudry, MD[1,3,4]; Cédric Rafat, MD[1]; Vincent Labbé, MD[1]; Nicolas Dufour, MD[1,3,4]; Sylvain Jean-Baptiste, MD[1]; Alexandre Bedet, MD[1]; Didier Dreyfuss, MD[1,3,4]; Jean-Damien Ricard, MD, PhD[1,3,4]

TABLE 2. Oxygenation Variables, Adverse Events During and After Intubation, and ICU Mortality

Variable	Nonrebreathing Bag Reservoir Facemask $n = 50$	High-Flow Nasal Cannula Oxygen $n = 51$	p
Spo_2 after preoxygenation, %, median (IQR)	100 (98–100)	100 (100–100)	0.01[a]
Lowest Spo_2, median (IQR)	94 (83–98)	100 (95–100)	< 0.0001[b]
Adjusted lowest Spo_2, %, median[c]	94	99.2	0.007
Spo_2 upon respirator connection, %, median (IQR)	98 (92.5–100)	100 (99–100)	0.0004[b]
Spo_2 5 min after intubation, %, median (IQR)	100 (98.8–100)	100 (100–100)	0.002[b]
Spo_2 30 min after intubation, %, median (IQR)	100 (99–100)	100 (100–100)	0.024[b]
Spo_2 < 80%, n (%)	7 (14)	1 (2)	0.03[a]

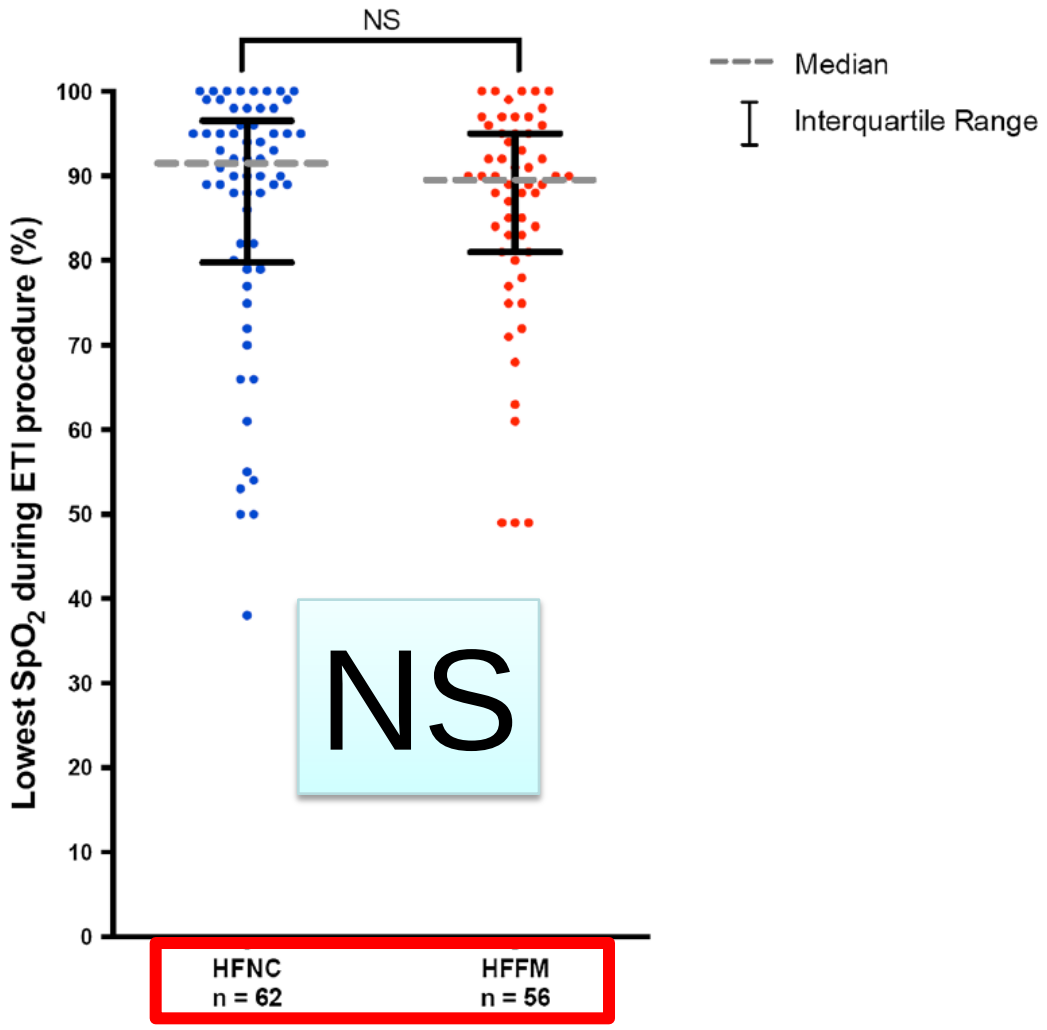
Miguel-Montanes et al. CCM 2015



High-flow nasal cannula oxygen during endotracheal intubation in hypoxemic patients: a randomized controlled clinical trial

Intensive Care Med 2015

Mickaël Vourc'h
Pierre Asfar
Christelle Volteau
Konstantinos Bachoumas
Noëmie Clavieras
Pierre-Yves Egreteau
Karim Asehnoune
Alain Mercat
Jean Reignier
Samir Jaber
Gwenaël Prat
Antoine Roquilly
Noëlle Brule
Daniel Villers
Cédric Bretonniere
Christophe Guitton



Median (IQR)	91.5 (80-96)	89.5 (81-95)	**p = 0.44**
Mean (SD)	86.2 (15.2)	85.9 (12.9)	

Preoxygenation before intubation in ICU : new approaches ?

1. Non-Invasive Ventilation (NIV/CPAP)
2. High Flow Oxygen Cannula (HFNC)
3. **Combined NIV + HFNC ?**

“OPTINIV preoxygenation method” =

Preoxygenation in NIV + Continuous High Flow Oxygen

1. Preoxygenation with NIV

Before Intubation

(Positive Pressure = Alveolar recruitment)

+

2. Apneic Oxygenation

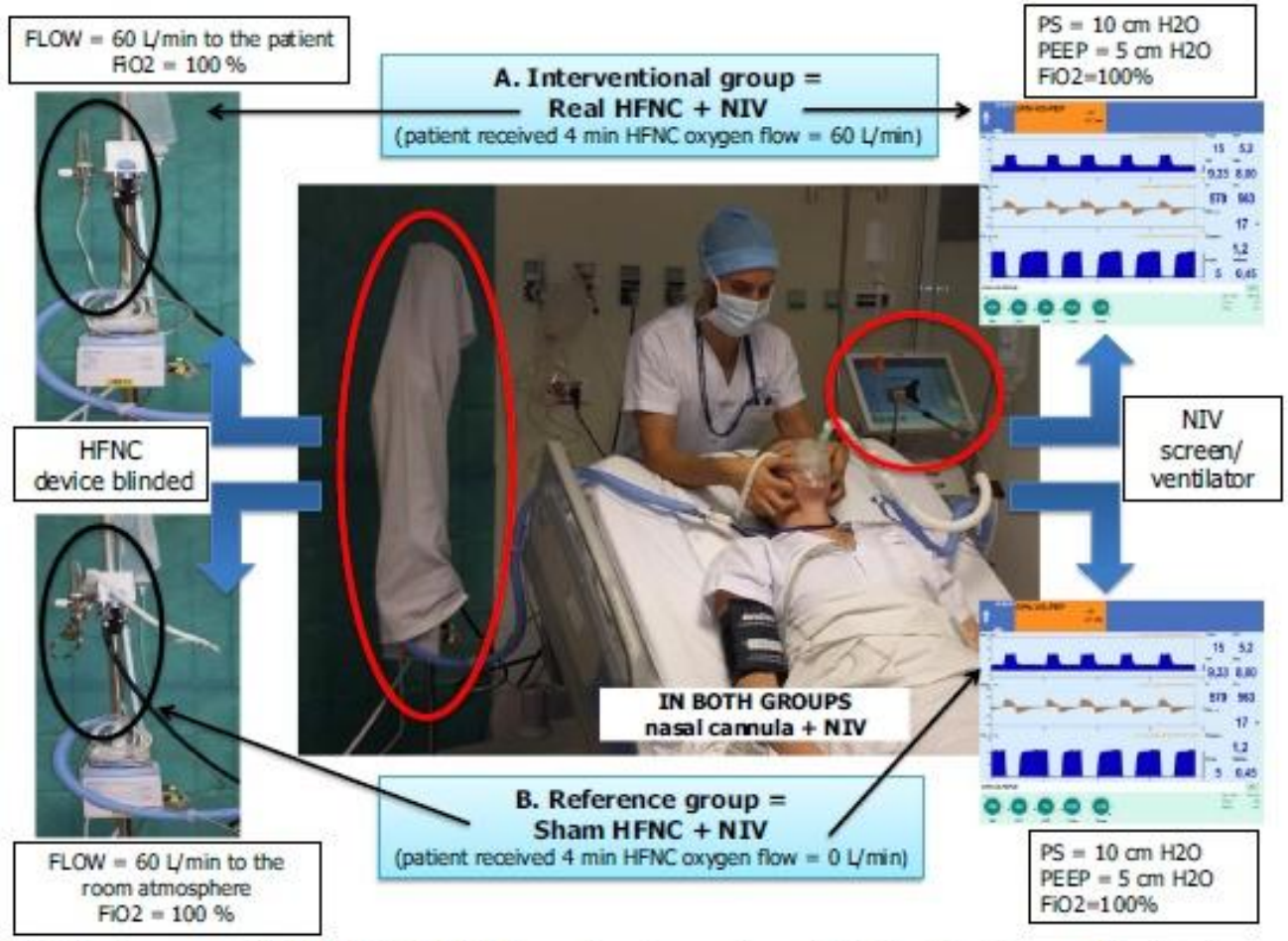
During and before Intubation

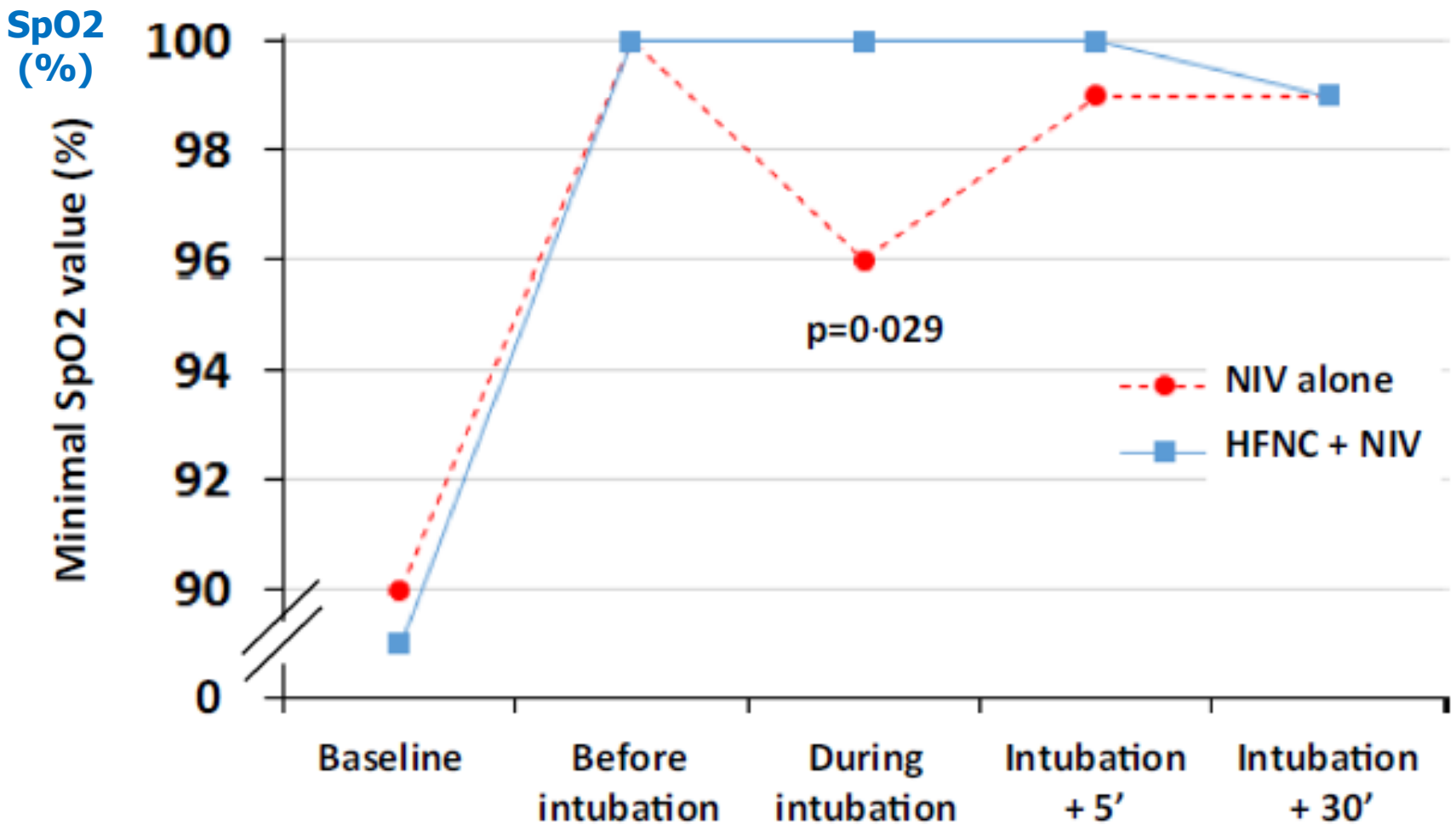
(Continuous Oxygen Insufflation during laryngoscopy)

Apnoeic oxygenation via high-flow nasal cannula oxygen combined with non-invasive ventilation preoxygenation for intubation in hypoxaemic patients in the intensive care unit: the single-centre, blinded, randomised controlled OPTINIV trial

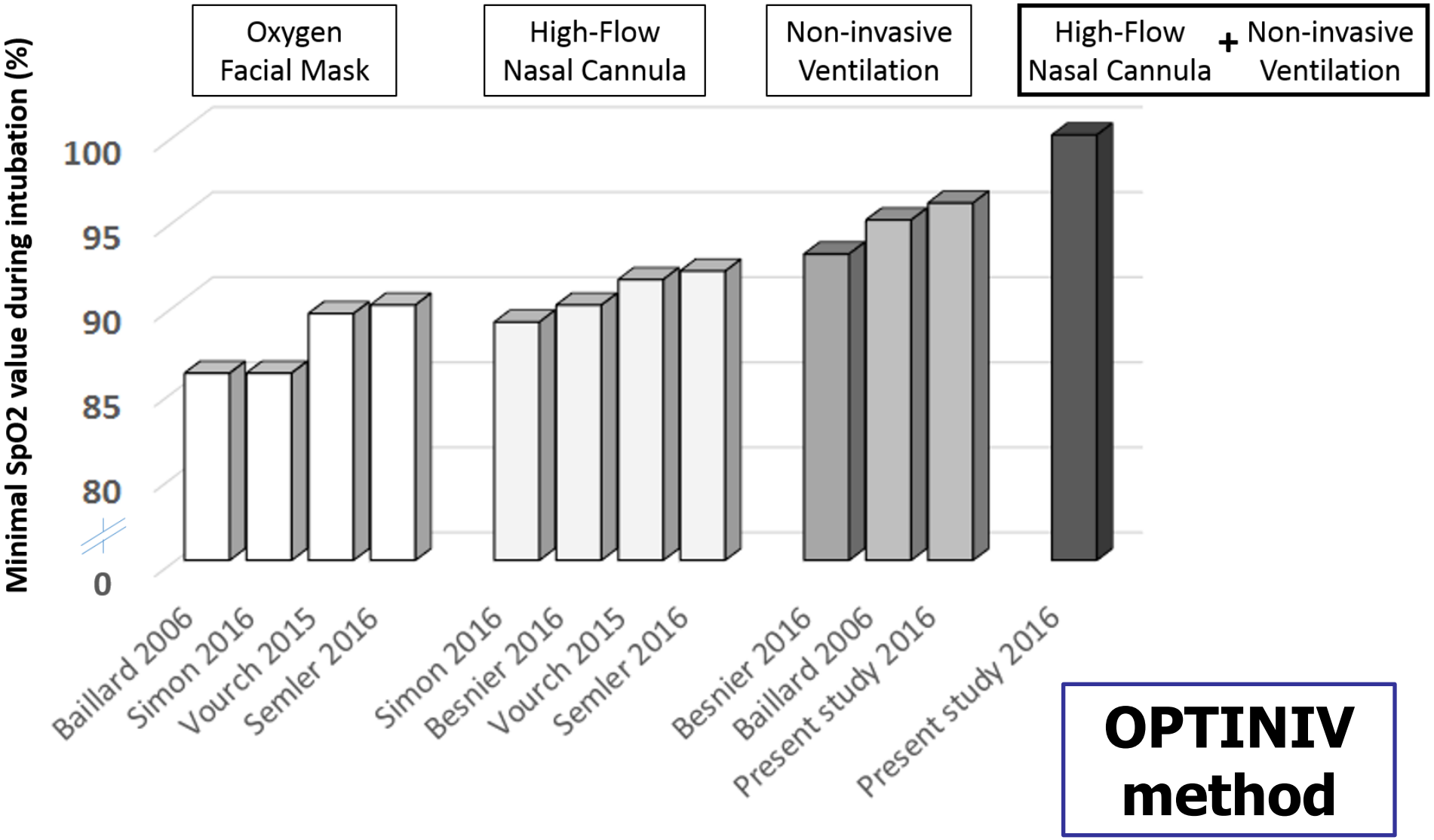
Samir Jaber[1,2*], Marion Monnin[1], Mehdi Girard[1], Matthieu Conseil[1], Moussa Cisse[1], Julie Carr[1], Martin Mahul[1], Jean Marc Delay[1], Fouad Belafia[1], Gérald Chanques[1,2], Nicolas Molinari[3] and Audrey De Jong[1,2]

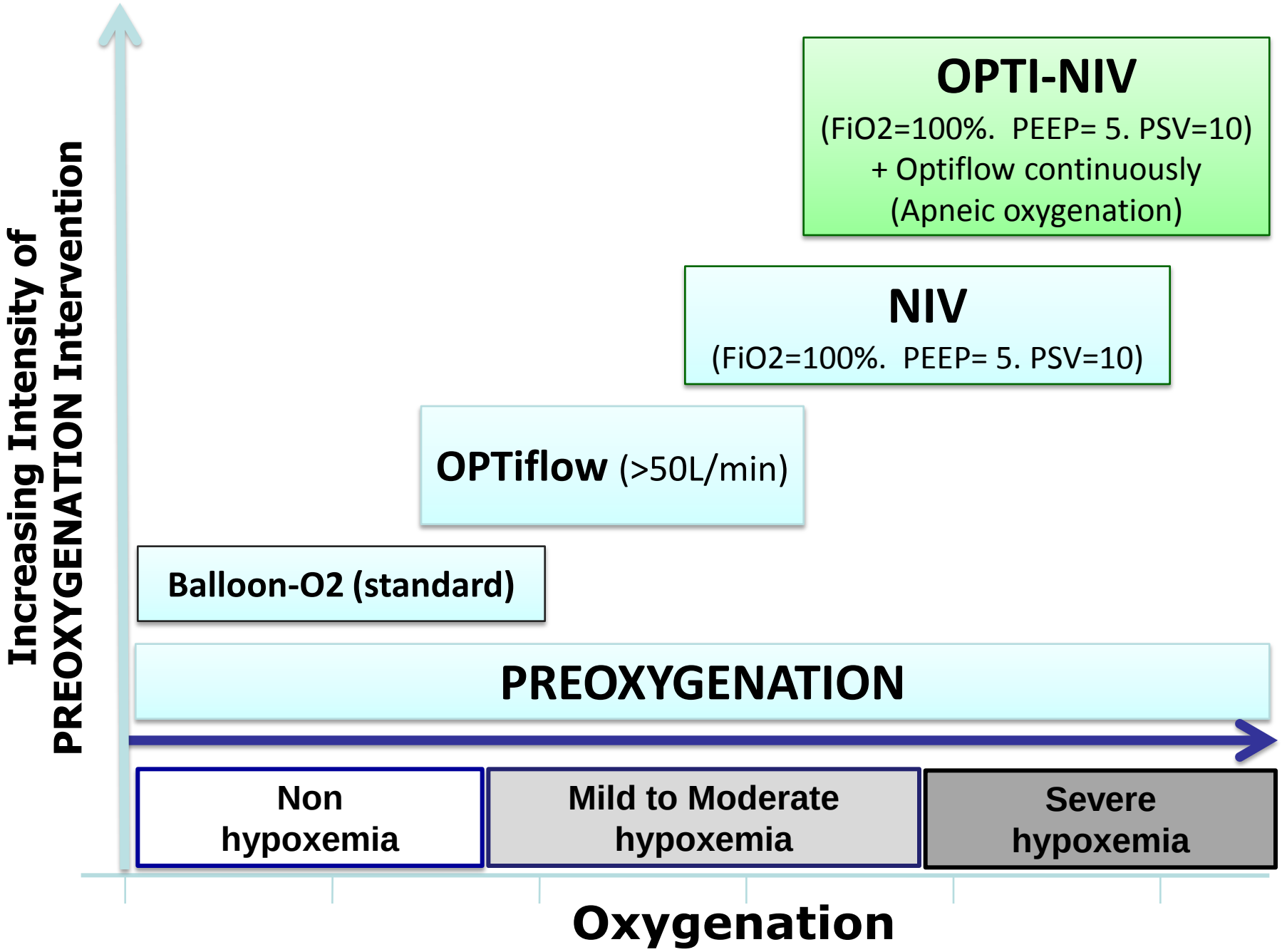
ICM 2016





NIV mediane (IQR)	90 (86-93)	100 (96-100)	**96 (92-99)**	99 (92-100)	99 (97-100)
NIV+ HFNC mediane (IQR)	89 (87-92)	100 (99-100)	**100 (95-100)**	100 (100-100)	99 (98-100)


Oxygen Facial Mask
High-Flow Nasal Cannula
Non-invasive Ventilation
High-Flow Nasal Cannula + Non-invasive Ventilation
Minimal SpO2 value during intubation (%)
100
95
90
85
80
0
Baillard 2006
Simon 2016
Vourch 2015
Semler 2016
Simon 2016
Besnier 2016
Vourch 2015
Semler 2016
Besnier 2016
Baillard 2006
Present study 2016
Present study 2016
OPTINIV method


Increasing Intensity of
PREOXYGENATION Intervention
OPTI-NIV
(FiO2=100%. PEEP= 5. PSV=10)
+ Optiflow continuously
(Apneic oxygenation)
NIV
(FiO2=100%. PEEP= 5. PSV=10)
OPTiflow (>50L/min)
Balloon-O2 (standard)
PREOXYGENATION
Non hypoxemia
Mild to Moderate hypoxemia
Severe hypoxemia
Oxygenation

How to improve intubation procedure ?
"5 main Practices"

1. Preparation (patient-material…)
2. Pre-Oxygenation
3. **Prevention collapse** (Fluid loading and vasopressors)
4. Paralysis (RSI, Sellick…) – Drugs
5. Post-Intubation (tube-Capnogram…)

Incidence of and risk factors for severe cardiovascular collapse after endotracheal intubation in the ICU: a multicenter observational study

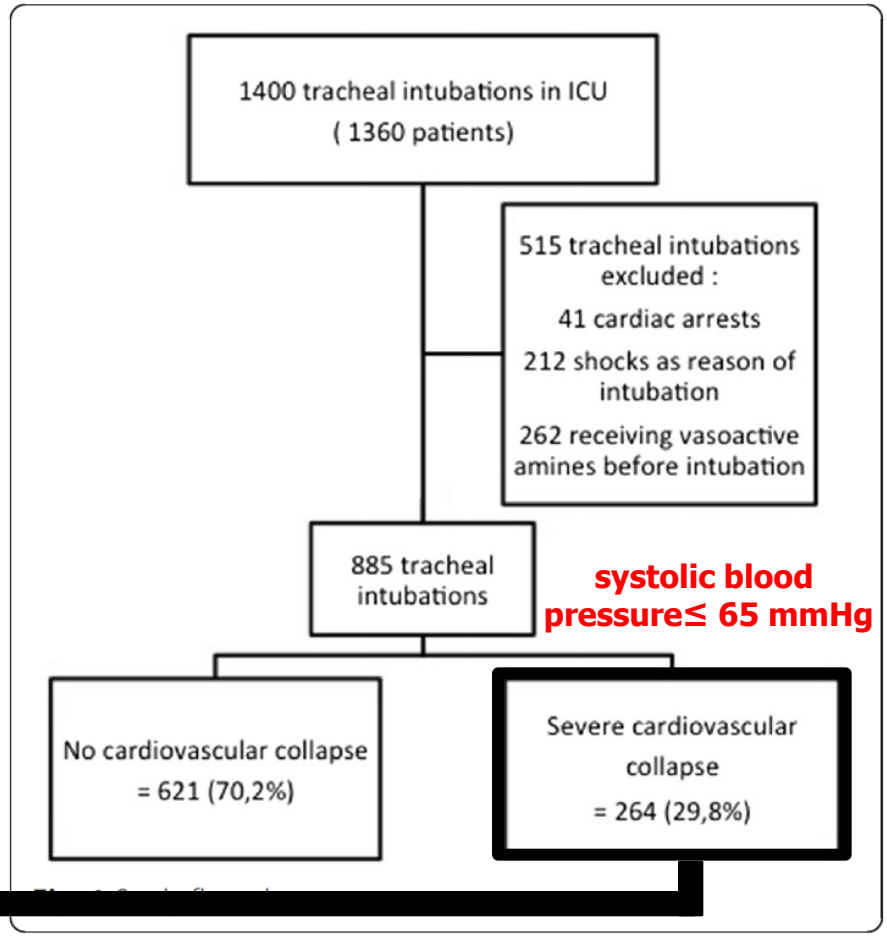
Critic Care 2015

Sebastien Perbet[1], Audrey De Jong[2], Julie Delmas[1], Emmanuel Futier[1], Bruno Pereira[3], Samir Jaber[2] and Jean-Michel Constantin[1*]

Hypotension post-intubation

"collapsus de reventilation"

30 %



How to improve intubation procedure ?
"5 main Practices (5-P)"

1. Preparation (patient-material…)
2. Pre-Oxygenation
3. Prevention collapse (Fluid loading and vasopressors)
4. Paralysis (RSI, Sellick…) – Drugs
5. Post-Intubation (tube-Capnogram…)

Anesthetic drugs
(First choice proposition)

1. Hypnotic →
   - Etomidate : 0,3 à 0,5 mg/kg IV
   or
   - Ketamine: 1,5 à 2 mg/kg IV

2. Morphinic → = O (avoid)

3. Myorelaxant →
   - Celocurine : 1 mg/kg IV
   contra-indications (HyperK, Allergy, burns, neuromyopathy….)

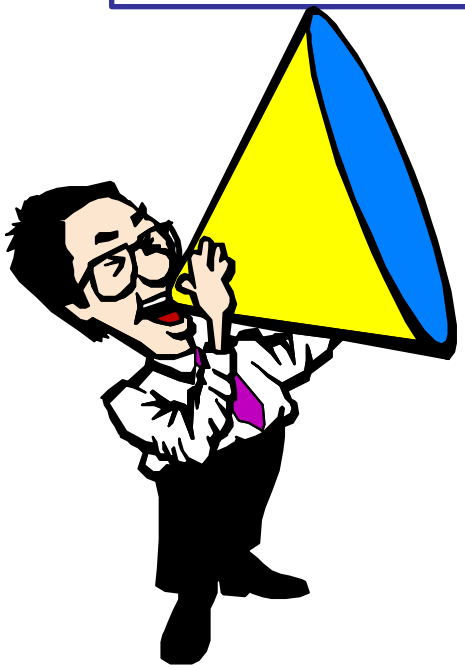
   or

   - Esmeron (Rocuronium) 1,5 mg/Kg IV

Key MESSAGE

Anesthesic drugs

« Low, is yet enough .... »



Moreover if myorelaxant was used in a (very) weak patient (hemodynamic failure !)

Intensive Care Med
DOI 10.1007/s00134-009-1717-8

ORIGINAL

Samir Jaber
Boris Jung
Philippe Corne
Mustapha Sebbane
Laurent Muller
Gerald Chanques
Daniel Verzilli
Olivier Jonquet
Jean-Jacques Eledjam
Jean-Yves Lefrant

An intervention to decrease complications related to endotracheal intubation in the intensive care unit: a prospective, multiple-center study

ICM. 2010

10 recommendations (M.I.P) :

« MONTPELLIER-INTUBATION-PROTOCOL »

1. Pre-intubation
2. Per-intubation
3. Post-intubation

Recommendations for intubation procedure in ICU

1. Pre-intubation

1. Fluid loading (500 ml cristalloides or 250 ml colloides)
2. Vasopressive drugs (early if diastolic arterial pressure < 35 mmHg)
3. Preoxygenation with noninvasive positive pressure ventilation (NIV)
4. Prepare long term sedation
5. Presence of two operators

2. Per-intubation

6. Rapid Sequence Induction (RSI): hypnotic (Etomidate or ketamine) + NMBA (succinylcholine) if no contre-indication with Sellick maneuver

3. Post-intubation

7. Verify tube placement with capnograph
8. Early administration of vasopressive drugs if persistant collapsus
9. Initiate sedation
10. Low initial tidal volume= 5-7 ml/kg (Pplat < 25-30 cmH2O)

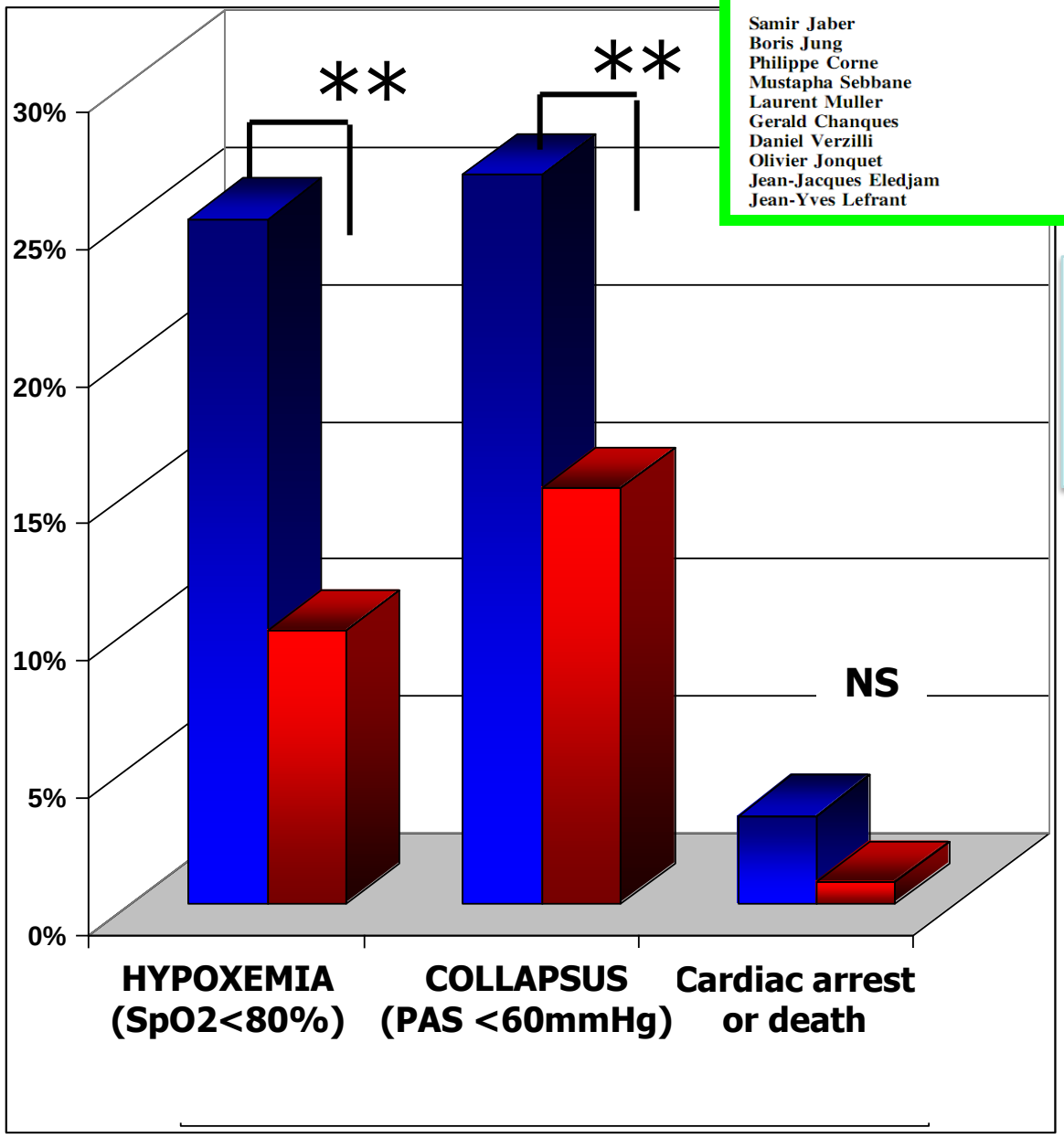
Intensive Care Med
DOI 10.1007/s00134-009-1717-8

ORIGINAL

Samir Jaber
Boris Jung
Philippe Corne
Mustapha Sebbane
Laurent Muller
Gerald Chanques
Daniel Verzilli
Olivier Jonquet
Jean-Jacques Eledjam
Jean-Yves Lefrant

An intervention to decrease complications related to endotracheal intubation in the intensive care unit: a prospective, multiple-center study

2010



Significant reduction of severe life-threatening complications :
32% vs 17% (p=0.01)

Jaber et coll. ICM 2010

A modified Montpellier protocol for intubating intensive care unit patients is associated with an increase in first-pass intubation success and fewer complications

Keith A. Corl, MD [a,b,c,*], Christopher Dado, MD [a], Ankita Agarwal, MD [a], Nader Azab, MD [a], Tim Amass, MD [a,c], Sarah J. Marks, MS [b], Mitchell M. Levy, MD [a], Roland C. Merchant, MD, MPH, ScD [b,c], Jason Aliotta, MD [a]

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Changes in adherence to protocol components.

	Control period N (%) (n = 137)	Intervention period N (%) (n = 138)	Absolute change % (95% CI)	p-Value
Pre-intubation				
1 Two or more capable intubators	106 (77.4)	102 (73.9)	−3.5 (−13.6, 6.6)	0.57
2 IV fluids administered	59 (43.1)	111 (80.4)	37.4 (26.8, 48)	<0.0001
3 Sedation ordered	78 (55.9)	114 (82.6)	25.7 (15.3, 36.1)	<0.0001
4 Pre-oxygenation with NIPPV, HFNC, or non-rebreather	72 (52.6)	98 (71.0)	18.5 (7.2, 29.8)	<0.01
Intubation				
5 RSI	66 (48.2)	103 (74.6)	26.5 (15.4, 37.6)	<0.0001
Post-intubation				
6 Capnography	134 (97.8)	136 (98.6)	0.7 (−2.5, 3.9)	0.68
7 Appropriate use of vasopressors for shock (MAP < 65 mm Hg)	133 (97.1)	138 (100.0)	2.9 (0, 5.7)	0.06
8 Sedation administered	80 (58.4)	118 (85.5)	27.1 (17, 37.2)	<0.0001

IV Intravenous, *HFNC* high flow nasal cannula, *MAP* mean arterial pressure, *mm Hg* millimeters mercury, *NIPPV* non-invasive positive pressure ventilation, *RSI* rapid sequence intubation.

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Intubation and patient level outcomes.

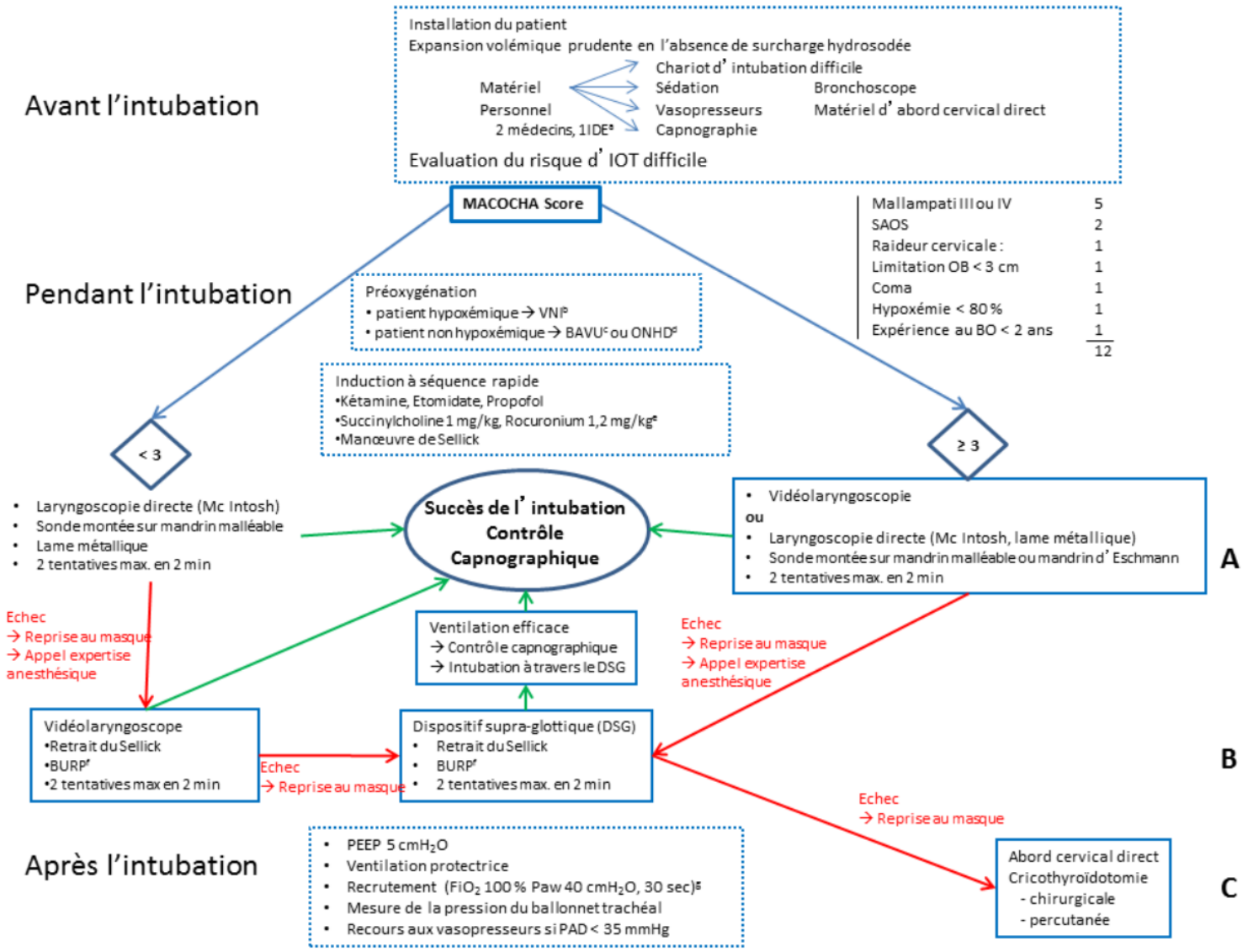
Intubation outcome	Control period N (%) (n = 137)	Intervention period N (%) (n = 138)	Absolute change % (95% CI)	p-Value
Successful first pass intubation[a]	80 (58.4)	103 (74.6)	16. 2 (5.1, 30.1)	<0.01
More than one provider attempted intubation	30 (21.9)	19 (13.8)	−8.1 (−17.0, 1.0)	0.08
All complications	59 (43.1)	42 (30.4)	−12.6 (−23.6, −1.2)	0.03
Major complications	29 (21.2)	18 (13)	−8.1 (−16.9, 0.9)	0.08
New sustained shock	7 (5.1)	5 (3.6)	−1.5 (−6.6, 3.7)	0.57
New severe hypoxemia	20 (14.6)	13 (9.4)	−5.2 (−12.9, 2.7)	0.20
Death/cardiac arrest	2 (1.5)	1 (0.7)	−0.7 (−3.8. 2.4)	0.62
Minor complications	43 (31.4)	30 (21.7)	−9.7 (−19.9, 0.8)	0.08
Arrhythmia	4 (2.9)	3 (2.2)	−0.8(−4.9, 3.4)	0.72
Aspiration	4 (2.9)	8 (5.8)	2.9 (−2.3, 8.0)	0.38
Vomiting without aspiration	4 (2.9)	2 (1.5)	−1.5 (−5.4, 2.5)	1.00
Dental injury	0 (0)	1 (0.7)	0.7 (−1.7, 3.2)	0.44
Esophageal intubation	9 (6.6)	6 (4.3)	−2.2 (−7.8, 3.4)	0.45
Difficult intubation	24 (17.5)	15 (10.9)	−6.7 (−114.8, 1.7)	0.12

Patient outcomes	Control period N (%)/median (IQR) (n = 130)	Intervention period N (%)/median (IQR) (n = 123)	Absolute change % (95% CI) or median difference (95% CI)	p-Value
Hospital length of stay	12 (7–20)	11 (6–20)	−1 (−3, 2)	0.55
ICU length of stay	7 (4–13)	7 (3−13)	0 (−2, 1)	0.89
Discharged alive	74 (56.9)	72 (58.5)	3.9 (−7.7, 15.5)	0.54

[a] Two attempts required in 31.4% of control period intubations and 19.6% in intervention period; three attempts required in 8.0% of control period intubations and 4.4% in intervention period, four or more attempts required in 2.1% of control period intubations and 1.4% in intervention period.

Recommandations Formalisées d'Expert 2016

Algorithme IOT en réanimation (Proposition des experts - Accord Faible)



BJA

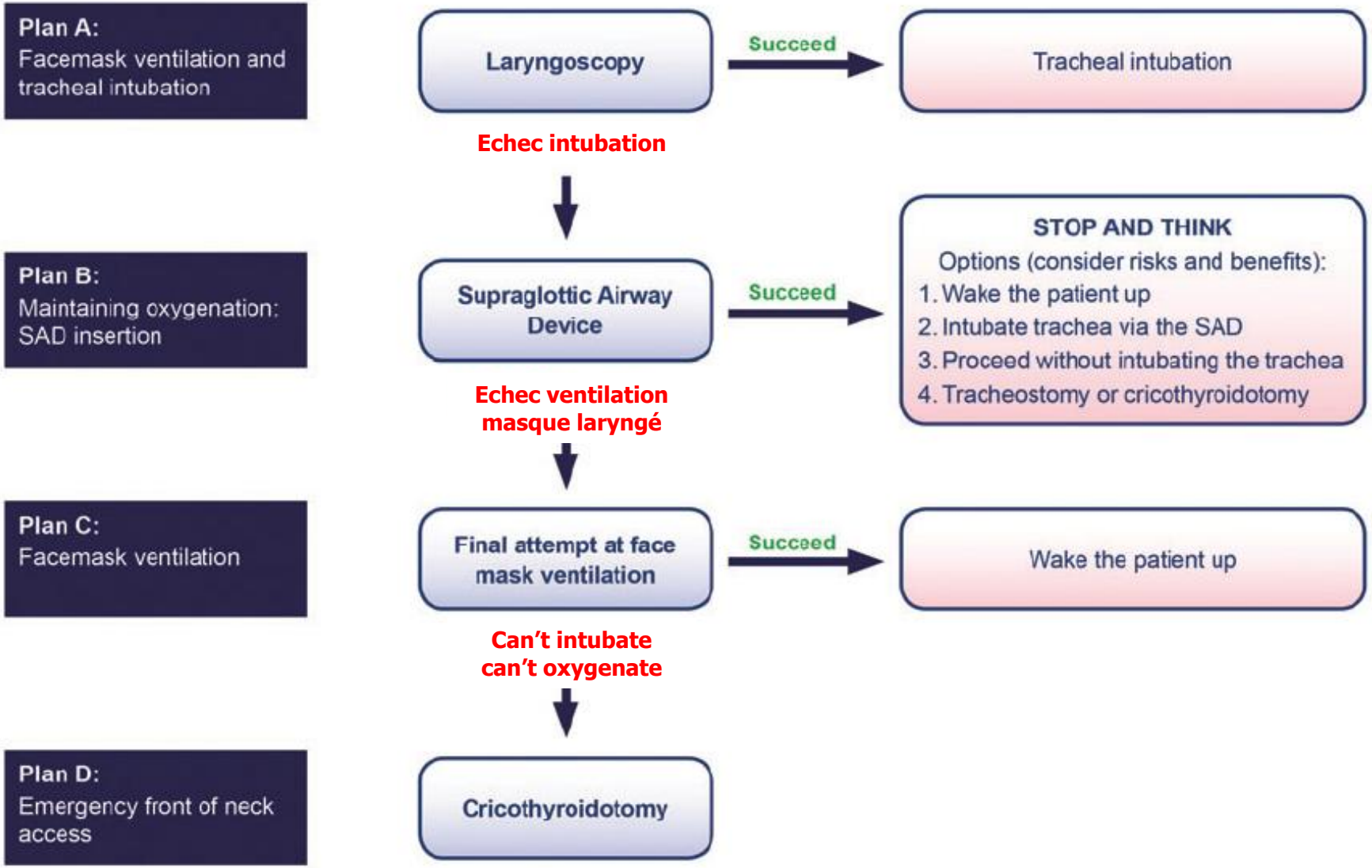
British Journal of Anaesthesia, 115 (6): 827–48 (2015)

doi: 10.1093/bja/aev371
Advance Access Publication Date: 10 November 2015
Special Article

SPECIAL ARTICLE

Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults†

C. Frerk[1,*], V. S. Mitchell[2], A. F. McNarry[3], C. Mendonca[4], R. Bhagrath[5], A. Patel[6], E. P. O'Sullivan[7], N. M. Woodall[8] and I. Ahmad[9], Difficult Airway Society intubation guidelines working group

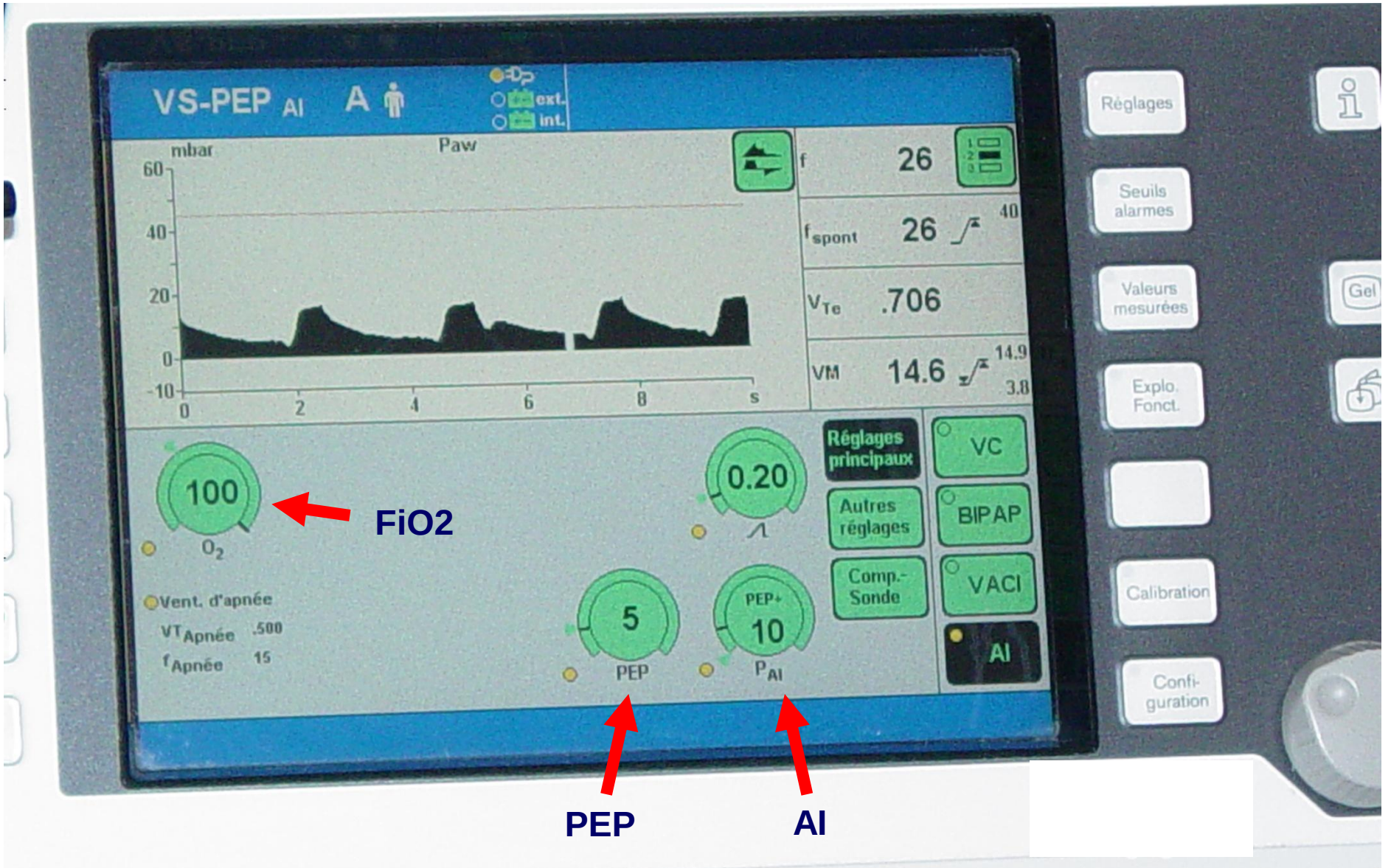


Frerk et al., *BJA* 2015

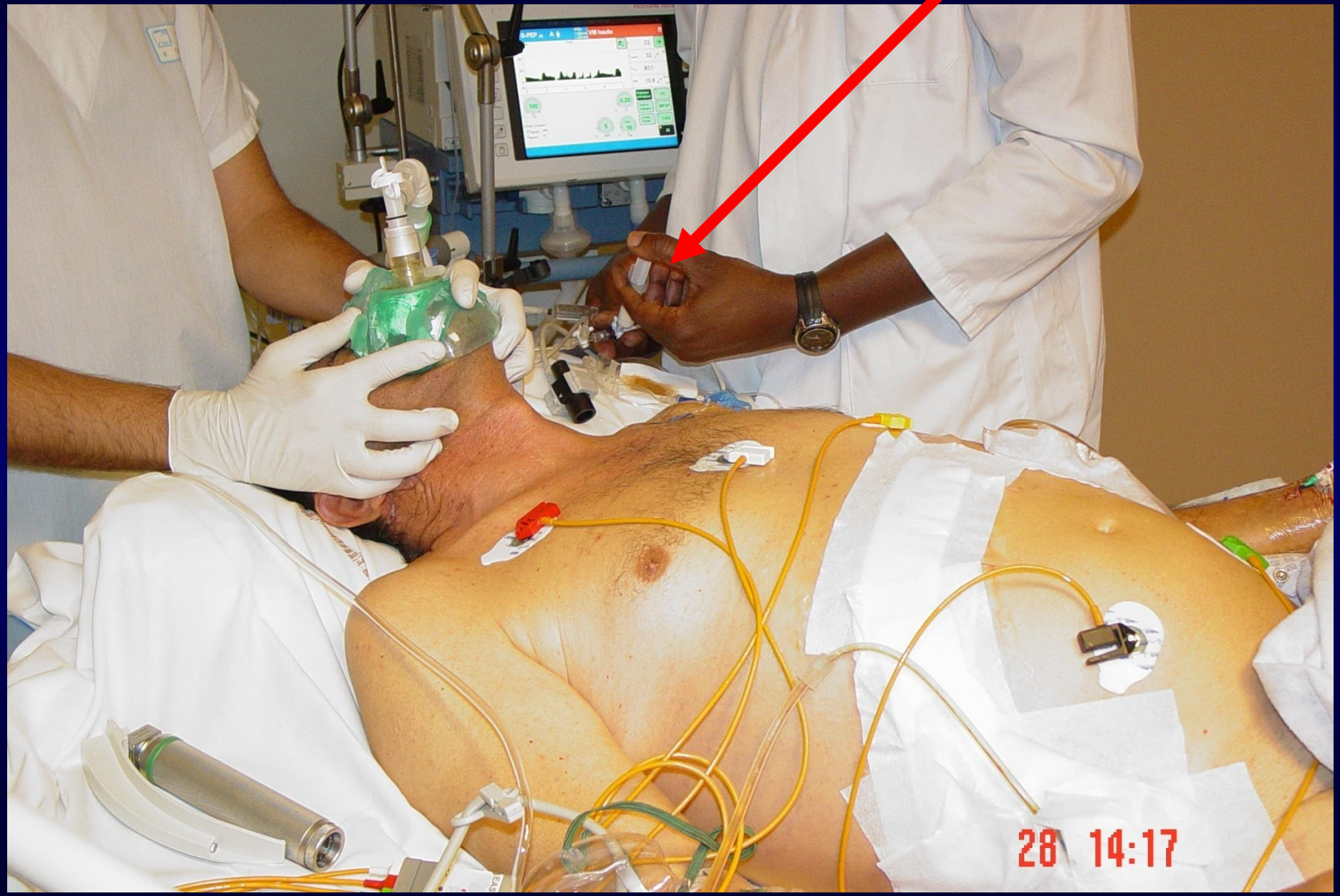
Recommandations in real life in an « hypoxemic critically ill patient »

APPLICATION AT BETSIDE

PREOXYGENATION in NIV (PSV+PEEP) during 3 min

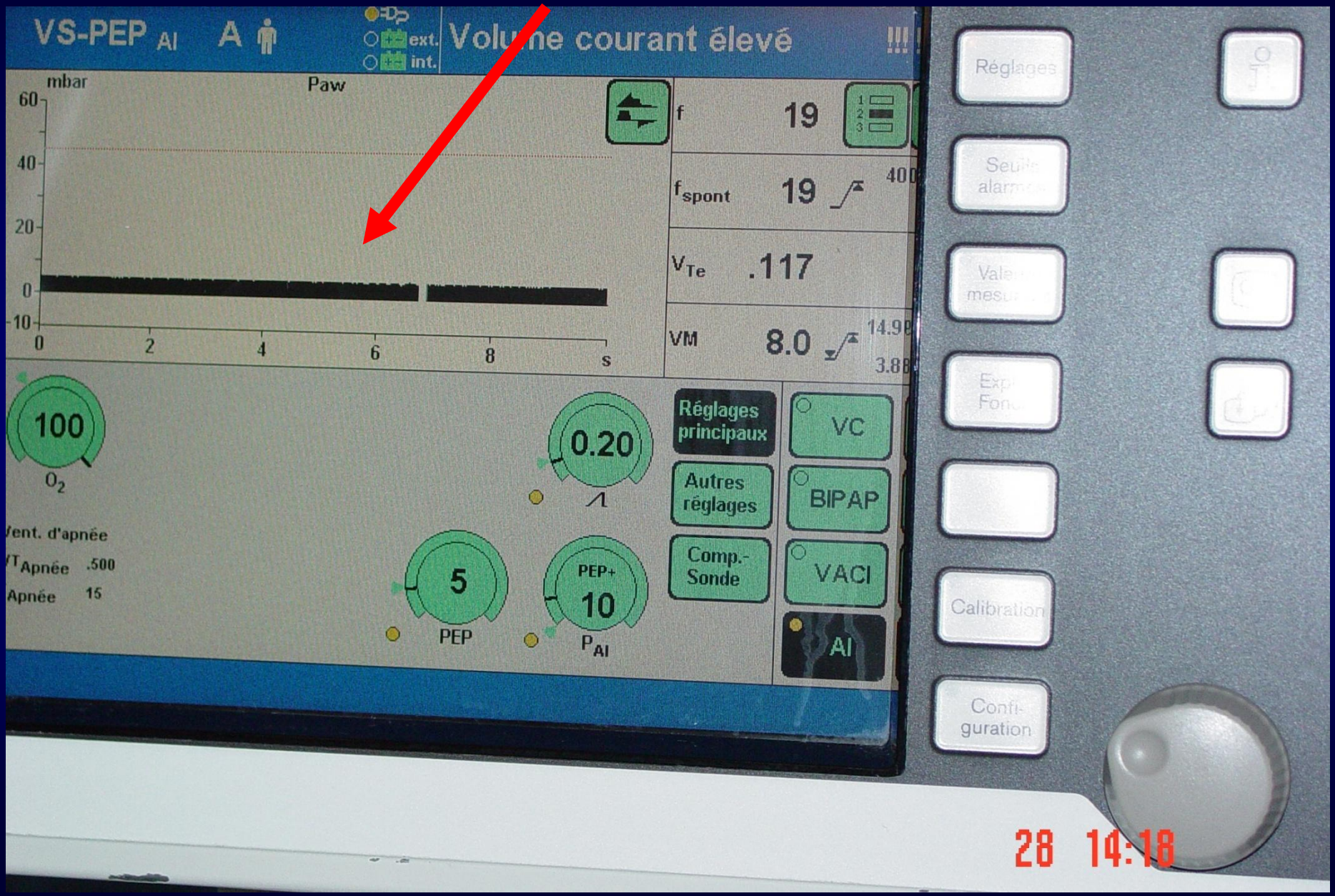


At the end of the 3 min of Preoxygenation in NIV : anesthesia induction



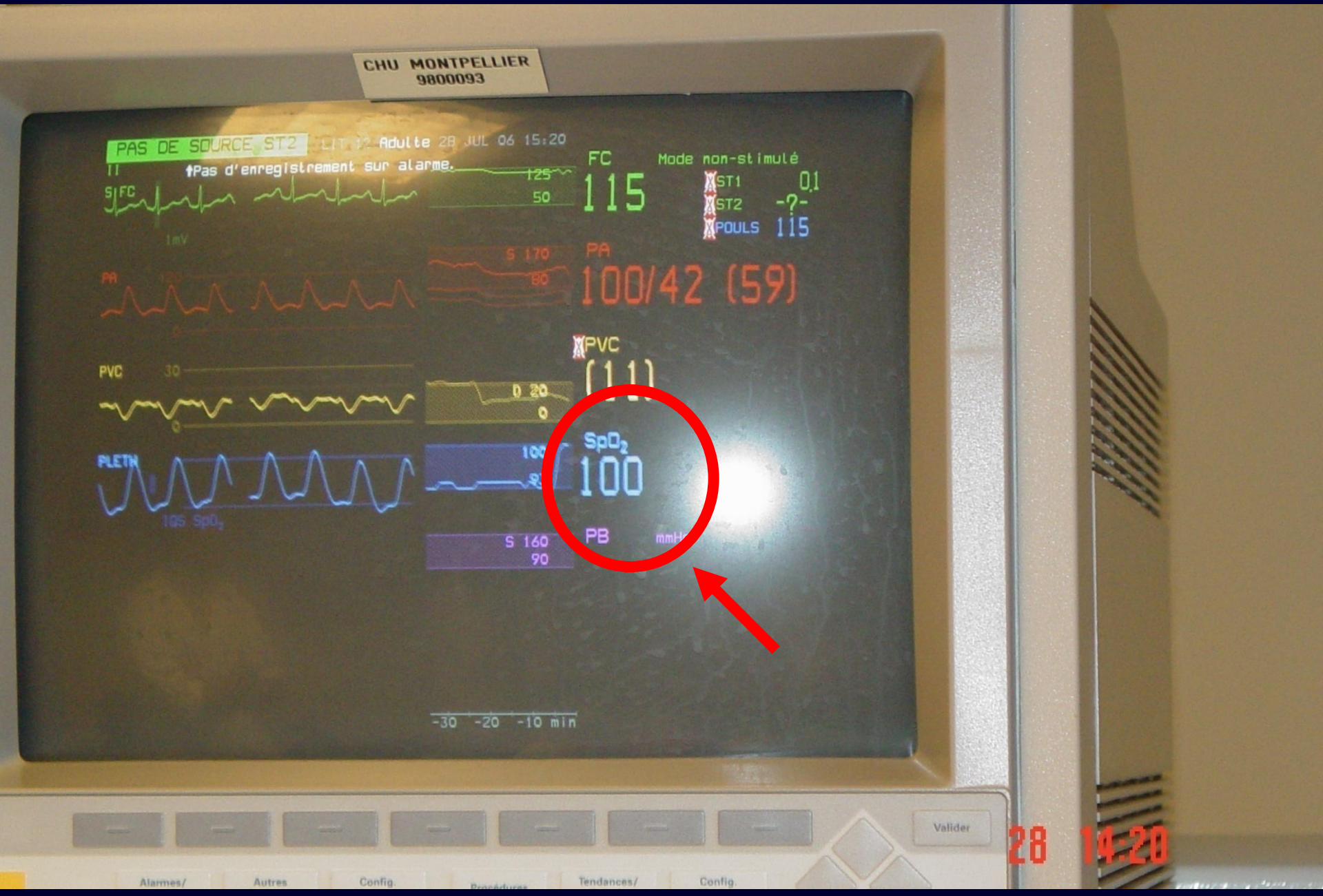
Wait apnea ….(30-60 s)

Apnea occured ….



Intubation….

Hemodynamic Parameters and oxygen saturation

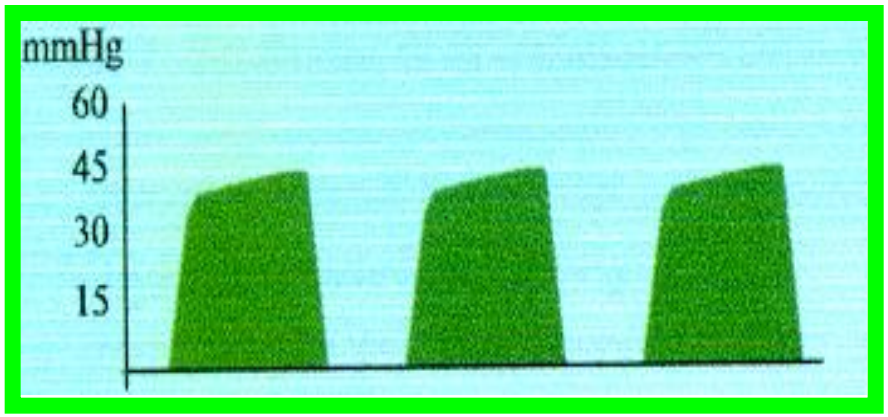


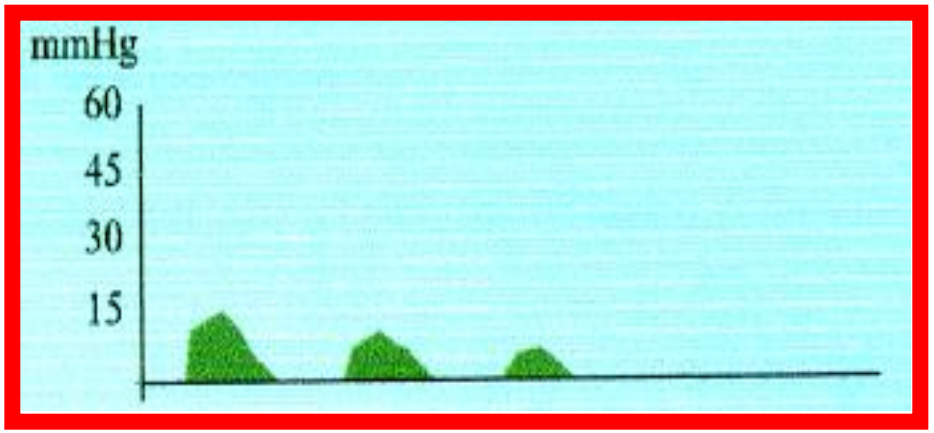
Intubation

How to improve intubation procedure ?
"5 main Practices"

1. **Preparation (patient-material…)**
2. **Pre-Oxygenation**
3. **Prevention collapse** (Fluid loading and vasopressors)
4. **Paralysis** (RSI, Sellick…) **– Drugs**
5. **Post-Intubation** (tube-Capnogram…)

CAPNOGRAM (EtCO2)





NORMAL

Esophageal intubation

Intensive Care Med
DOI 10.1007/s00134-009-1717-8

ORIGINAL

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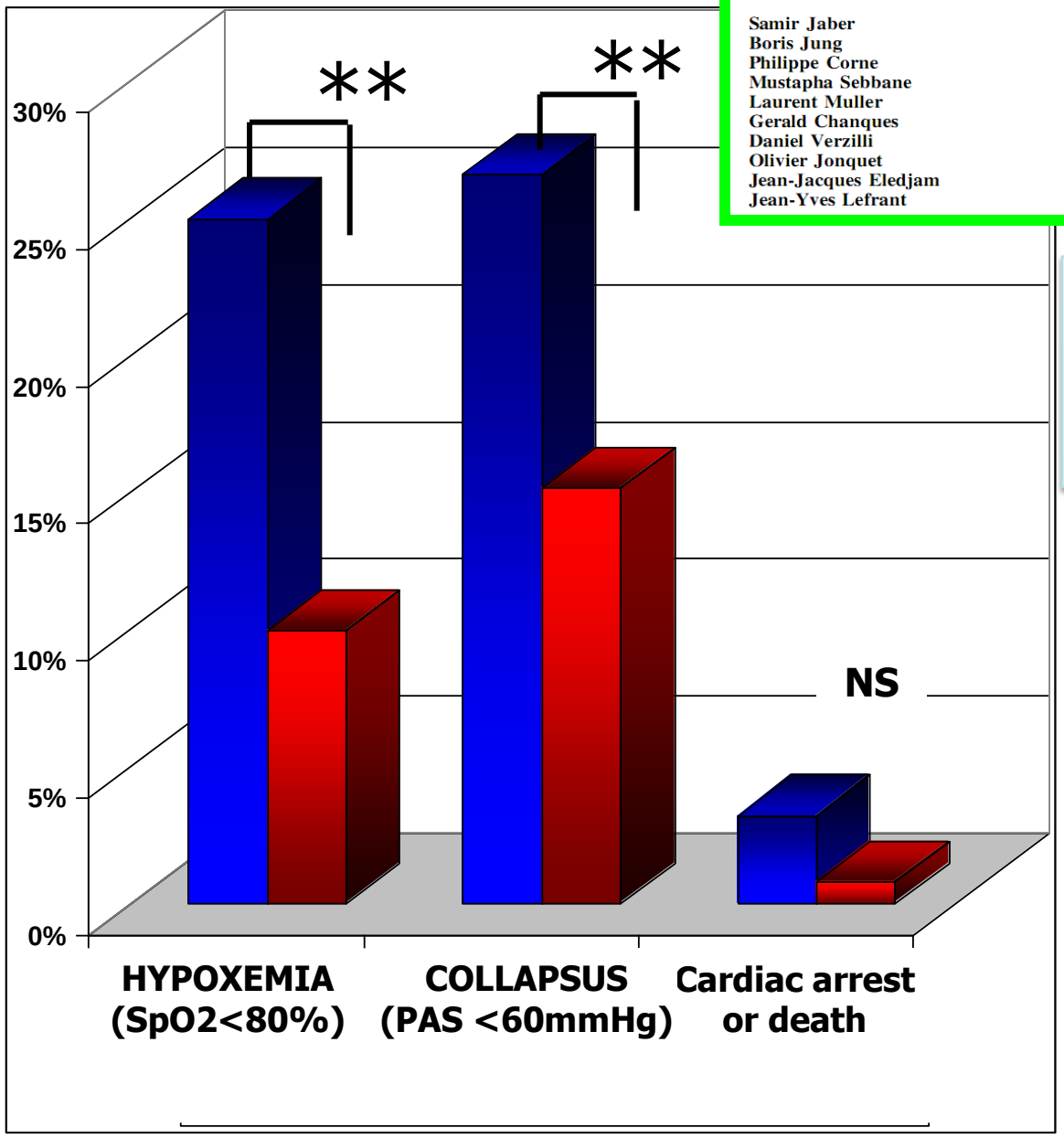

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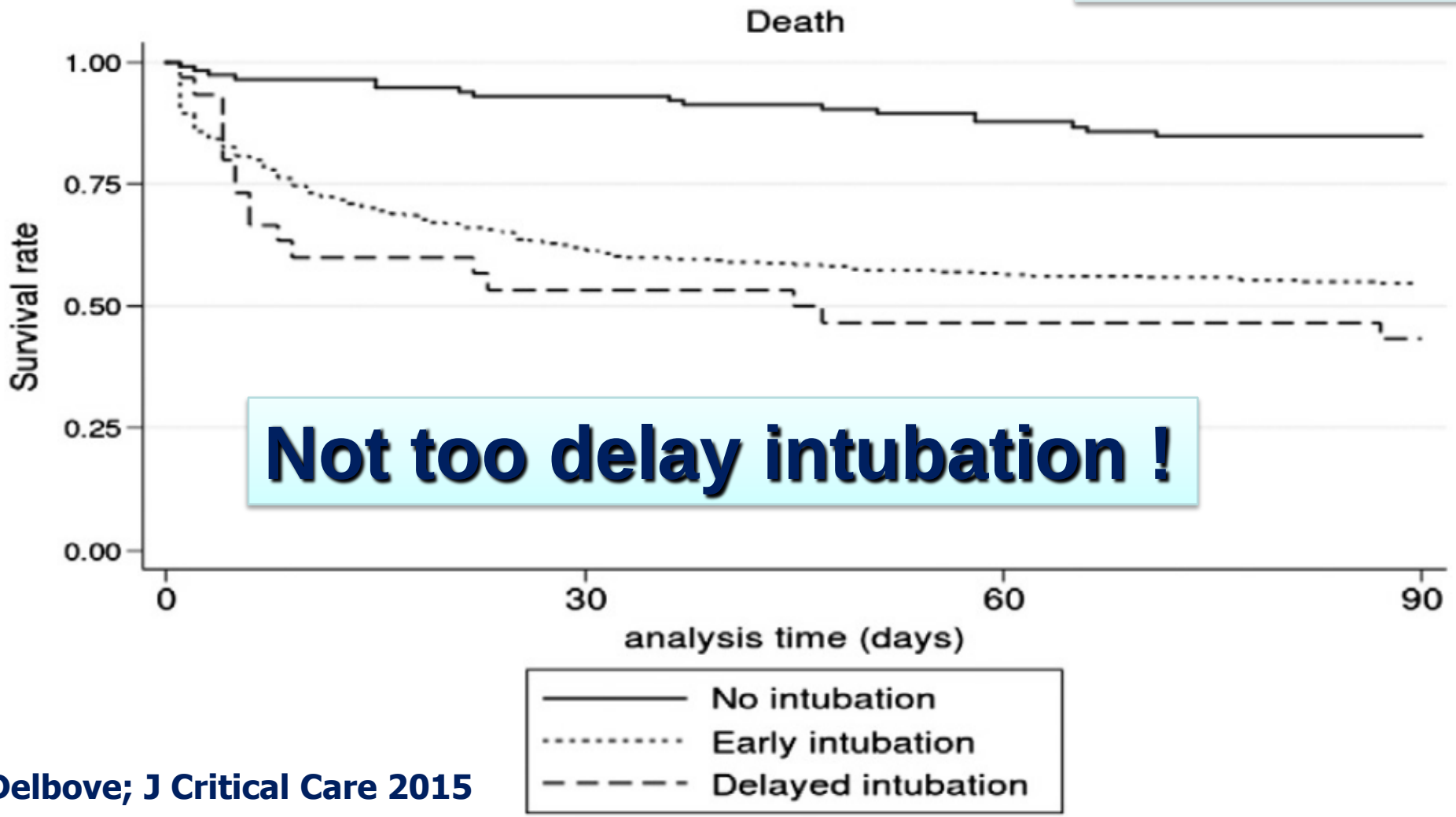
Simulation +++
GlideScope

Impact of endotracheal intubation on septic shock outcome: A post hoc analysis of the SEPSISPAM trial

Agathe Delbove, MD [a], Cédric Darreau, MD [b], Jean François Hamel, MD,PhD [c], Pierre Asfar, MD,PhD [b], Nicolas Lerolle, MD,PhD [b,*]

When intubate?



Not too delay intubation !

Delbove; J Critical Care 2015

Journal of Critical Care 42 (2017) 1–5

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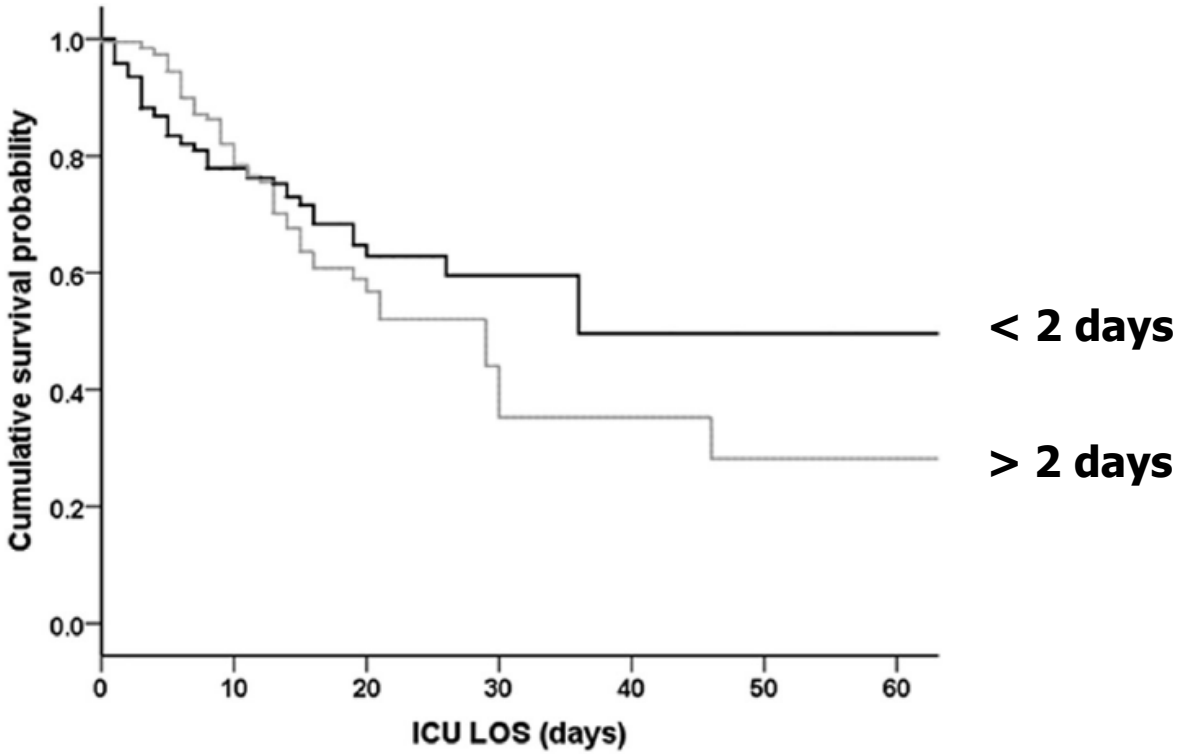
Association between timing of intubation and outcome in critically ill patients: A secondary analysis of the ICON audit

Philippe R. Bauer [a,*], Ognjen Gajic [a], Rahul Nanchal [b], Rahul Kashyap [c], Ignacio Martin-Loeches [d], Yasser Sakr [e], Stephan M. Jakob [f], Bruno François [g], Xavier Wittebole [h], Richard G. Wunderink [i], Jean-Louis Vincent [j], on behalf of the ICON Investigators (Supplemental Appendix 1)



Take Home Messages

CONCLUSION (1/2)

1. **Intubation : specifically approaches severe patient**
2. **Evaluate difficult intubation criteria ?**
3. **Use internal protocol (algorithm)/** *practices homogenization*
4. **Improve preoxygenation : priority (CPAP, NIV…)**
5. **Capnogram : systematic for check the good tube position**
6. **Applied rapid sequence induction (RSI)**
7. **Formation-training** (consider mannequin and simulation)++

CONCLUSION (2/2)

Algorithms should make the distinction between

The primary objective

=

OXYGENATION

The secondary objective

=

Tracheal intubation

Thank you