

GESTION DES VOIES AÉRIENNES EN RÉANIMATION

SESSION 2

Les enjeux de l'extubation des patients neurolésés

Pf K. ASEHNOUNE — CHU Nantes

Les enjeux de l'extubation du patient neurologisé

Karim Asehnoune

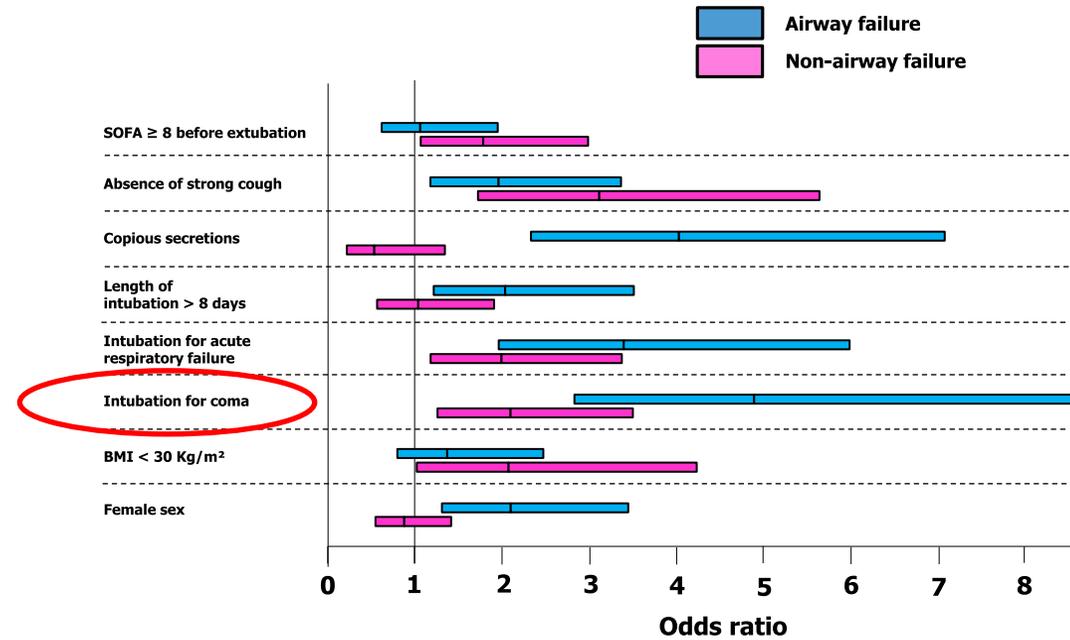
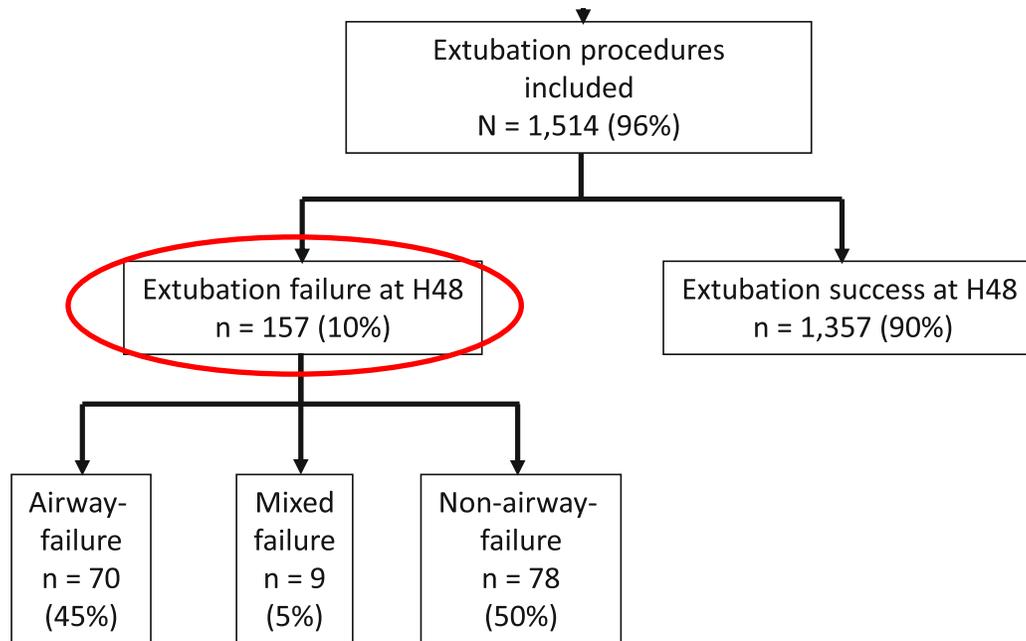
Laboratoire UPRES EA 3826 «Thérapeutiques cliniques et expérimentales des infections»

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No disclosure for this talk

Epidemiology of extubation failure



Epidemiology in NeuroICU

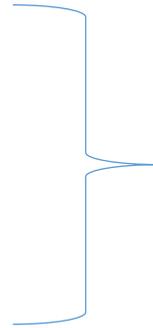
- Failure rate : 20-30%
- Time frame ?
- Tracheostomy and extubation failure ?

BACKGROUND

- Longer duration of mechanical ventilation in BI patients
- Patients excluded from guidelines for weaning from MV
- Extubation management? **blurry**
- Timing for tracheostomy? **blurry**

- Delaying extubation

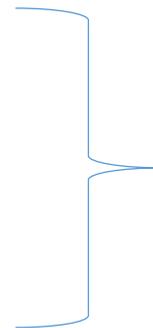
- Extubation Failure



2 Fears

- Level of consciousness

- Airway impairment



2 specific issues

Extubation success : airway

- Gag reflex
- Deglutition
- Cough

- Subjective
- Quantification ?
- Daily practice ?

Coplin *AJRCCM* 2000
McCredie *AATS* 2017
Godet *Anesthesiology* 2017
Asehnoune *Anesthesiology* 2017

Extubation success : general ICU features

- Fluid balance ++

Diuretics / Fluid balance control

- PES

Corticosteroids

- Bundle of care

TABLE 6 Failure criteria of spontaneous breathing trials

Clinical assessment and subjective indices	Agitation and anxiety
	Depressed mental status
	Diaphoresis
	Cyanosis
	Evidence of increasing effort
	Increased accessory muscle activity
Objective measurements	Facial signs of distress
	Dyspnoea
	$P_{a,O_2} \leq 50\text{--}60$ mmHg on $F_{i,O_2} \geq 0.5$ or $S_{a,O_2} < 90\%$
	$P_{a,CO_2} > 50$ mmHg or an increase in $P_{a,CO_2} > 8$ mmHg
	pH < 7.32 or a decrease in pH ≥ 0.07 pH units
	$f_R/V_T > 105$ breaths \cdot min $^{-1}\cdot$ L $^{-1}$
	$f_R > 35$ breaths \cdot min $^{-1}$ or increased by $\geq 50\%$
	$f_C > 140$ beats \cdot min $^{-1}$ or increased by $\geq 20\%$
	Systolic BP > 180 mmHg or increased by $\geq 20\%$
	Systolic BP < 90 mmHg
Cardiac arrhythmias	

Data taken from [16, 18, 19, 62, 116]. P_{a,O_2} : arterial oxygen tension; F_{i,O_2} : inspiratory oxygen fraction; S_{a,O_2} : arterial oxygen saturation; P_{a,CO_2} : arterial carbon dioxide tension; f_R : respiratory frequency; V_T : tidal volume; f_C : cardiac frequency; BP: blood pressure. 1 mmHg=0.133 kPa.

Agitation and anxiety
Depressed mental status

TABLE 5 Considerations for assessing readiness to wean

Clinical assessment	Adequate cough
	Absence of excessive tracheobronchial secretion
	Resolution of disease acute phase for which the patient was intubated
Objective measurements	Clinical stability
	Stable cardiovascular status (<i>i.e.</i> $f_C \leq 140$ beats \cdot min $^{-1}$, systolic BP 90–160 mmHg, no or minimal vasopressors)
	Stable metabolic status
	Adequate oxygenation
	$S_{a,O_2} > 90\%$ on $\leq F_{i,O_2} 0.4$ (or $P_{a,O_2}/F_{i,O_2} \geq 150$ mmHg)
	PEEP ≤ 8 cmH $_2$ O
	Adequate pulmonary function
	$f_R \leq 35$ breaths \cdot min $^{-1}$
	MIP ≤ -20 – -25 cmH $_2$ O
	$V_T > 5$ mL \cdot kg $^{-1}$
	VC > 10 mL \cdot kg $^{-1}$
	$f_R/V_T < 105$ breaths \cdot min $^{-1}\cdot$ L $^{-1}$
	No significant respiratory acidosis
	Adequate mentation
	No sedation or adequate mentation on sedation (or stable neurologic patient)

Adequate mentation

Impact of delayed extubation on brain-injured patients outcomes

Coplin et al. AJRCCM 2000

Observational study

136 BI patients

Complications	No delay	Extubation delay	<i>p</i> value
Number of patients	99	37	
Pneumonia, <i>N</i> (%)	21 (21.2%)	14 (37.8%)	0.048
ICU length of stay	3 (1-15)	8 (3-22)	<0.001
Death, <i>N</i> (%)	12 (12.1%)	10 (27%)	0.04

Complications associated with extubation failure

Complication	Patients	
	(n)	(%)
Total complications*	21	28.4
Pneumonia	13	17.6
Arrhythmia [†]	3	4.1
Atelectasis/lobar collapse	3	4.1
Myocardial infarction	2	2.7
Cerebrovascular accident	2	2.7

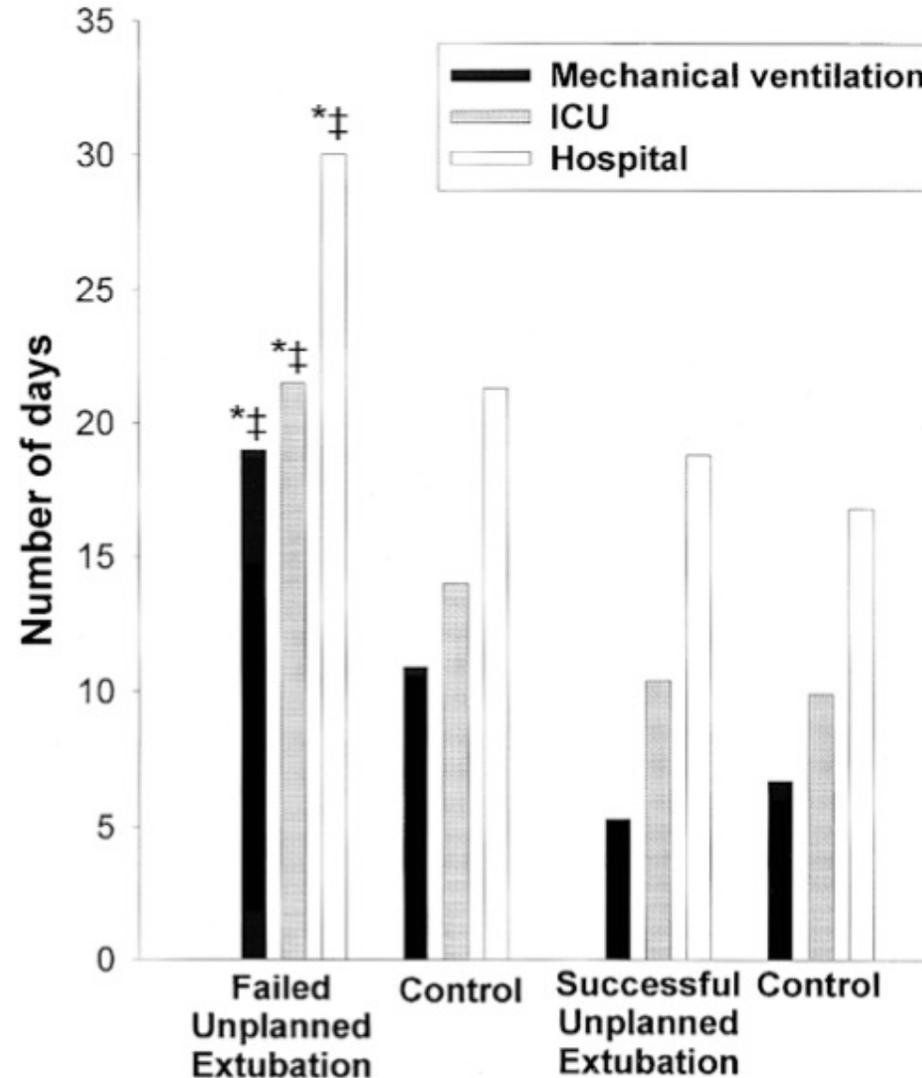
Both cause for extubation failure and time to reintubation were independently associated with hospital mortality

Extubation failure increases the morbi-mortality rate

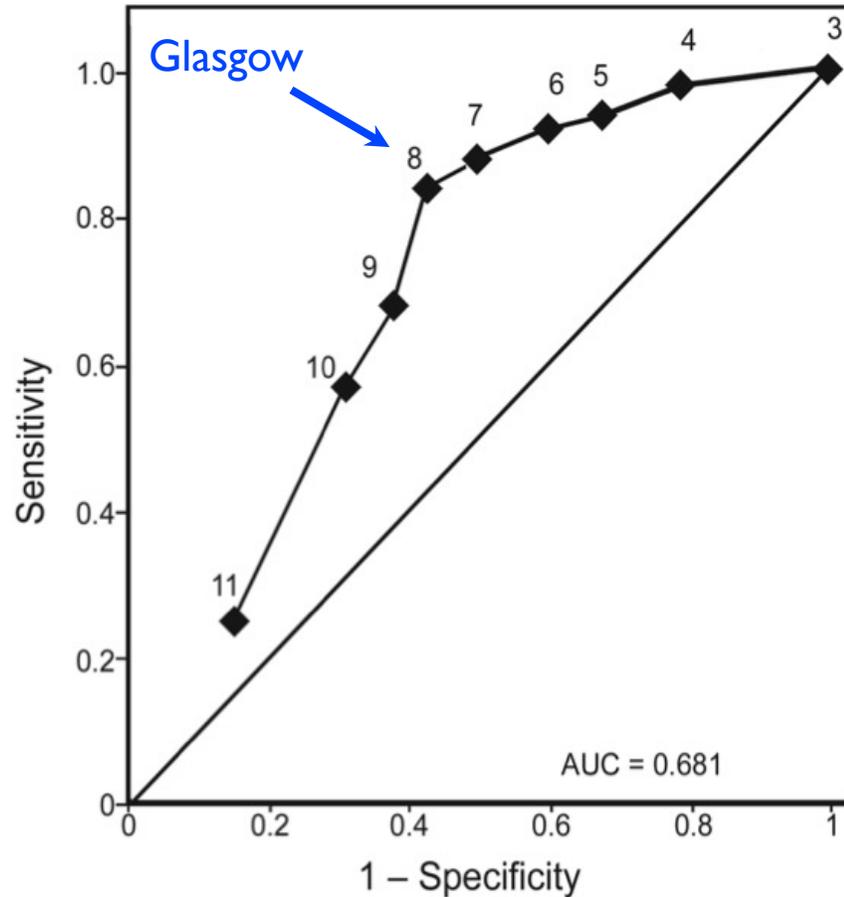
Epstein et al. AJRCCM 2000

Observational study

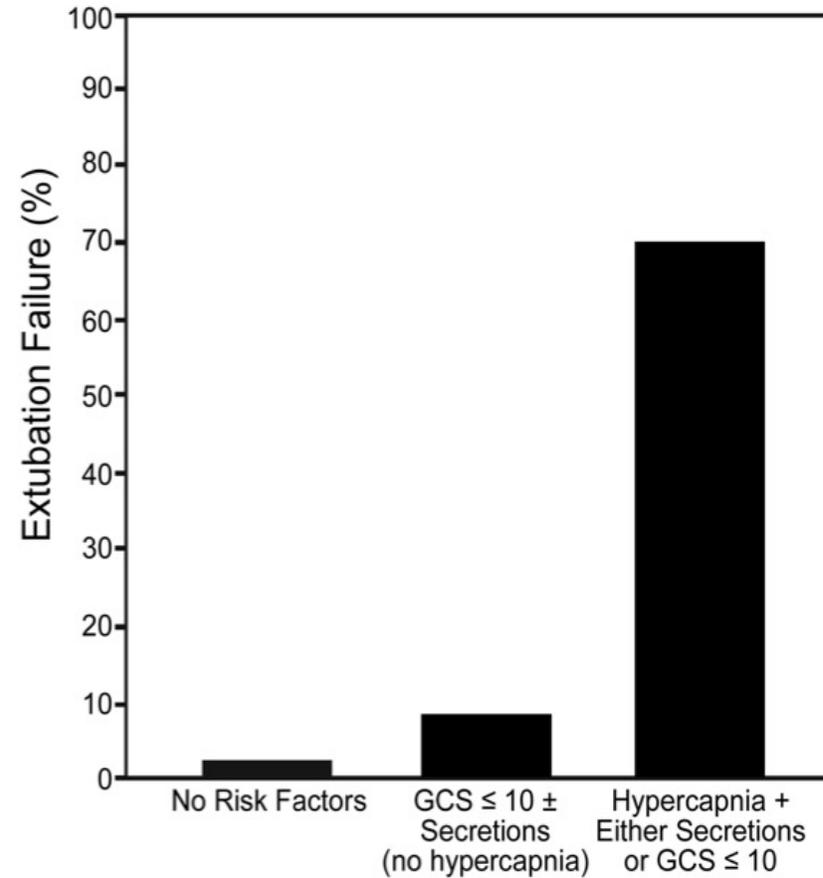
75 unplanned extubation / 220 control



Predicting factors of extubation failure in BI patients



Namen et al. AJRCCM 2001
Observational study
100 TBI patients



Salam et al. Intensive care med 2004
Observational study
14 Extubation failures / 84 patients

Impact of a bundle comprising of extubation criteria

Navalesi et al. CCM 2008

Before/after study

Extubation weaning criteria are achieved

+ Glasgow \geq 8

+ cough when endotracheal aspiration (ETA)

+ < 2 ETA / 4 hrs

	Intervention Group (n = 165)	Control Group (n = 153)	<i>p</i>
Primary end point			
Rate of reintubation, n (%)	9 (5)	18 (12)	0.047
Secondary end points			
Days of mechanical ventilation, mean (SD)	5.0 (5.6)	5.0 (5.0)	0.942
ICU stay, days, mean (SD)	8.1 (7.2)	8.8 (7.3)	0.379
Tracheotomy, n (%)	5 (3)	11 (7)	0.122
ICU mortality, n (%)	2 (1)	6 (4)	0.160

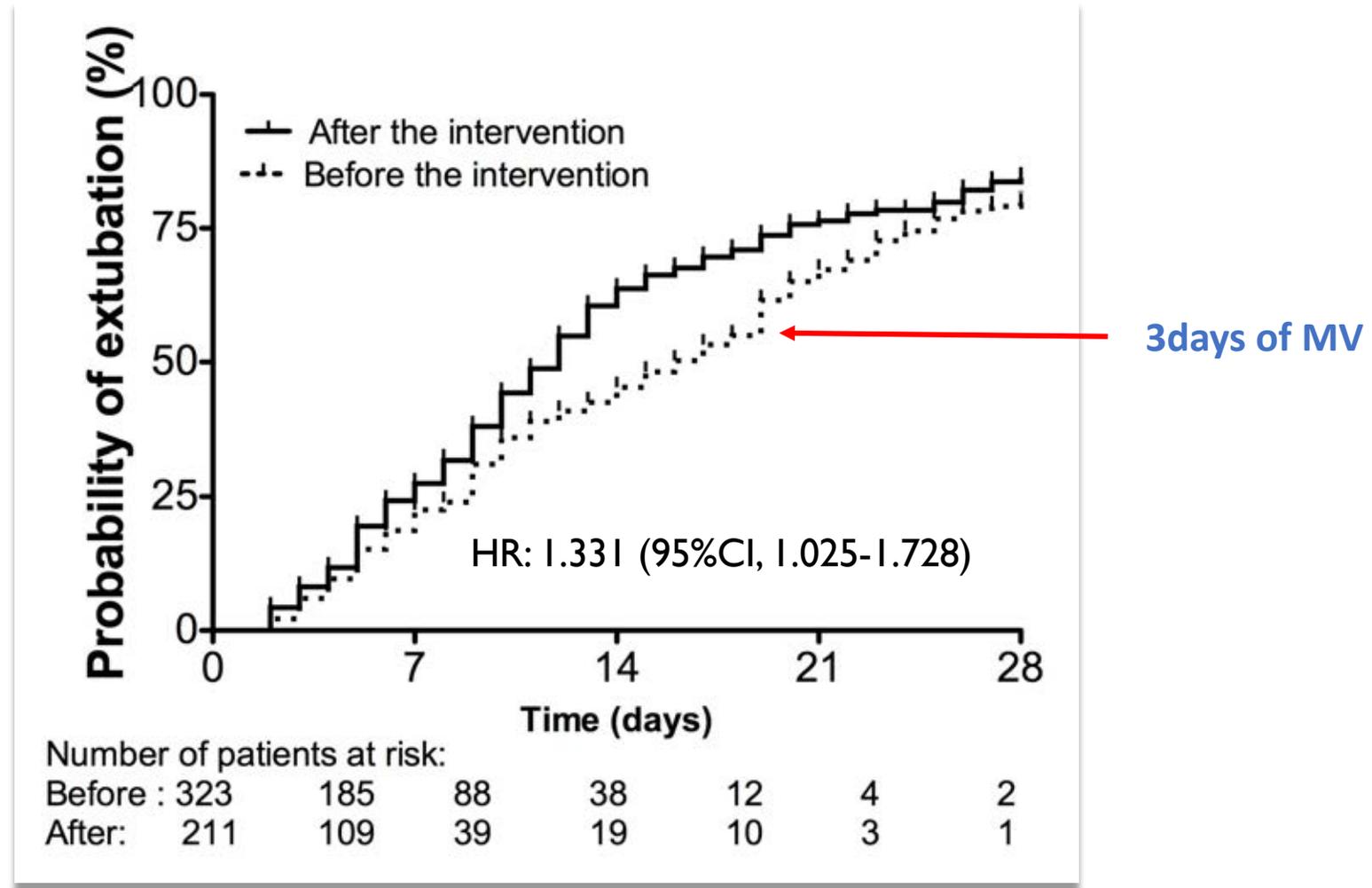
Strict compliance to predefined criteria (even subjective) improves outcome

evidence-based extubation readiness bundle in 499 brain-injured patients

Roquilly et al. AJRCCM 2013

322 patients before vs 214 patients after

1. Tidal Volume < 8 ml/kg, PEEP > 3
2. Probabilistic ATB for VAP
3. Extubation Glasgow 10
+ cough





A multi-faceted strategy to reduce ventilation-associated mortality in brain-injured patients. The BI-VILI project: a nationwide quality improvement project

Karim Asehnoune^{1,20*}, Ségolène Mrozek², Pierre François Perrigault³, Philippe Seguin⁴, Claire Dahyot-Fizelier⁵, Sigismond Lasocki⁶, Anne Pujol⁷, Mathieu Martin⁸, Russel Chabanne⁹, Laurent Muller¹⁰, Jean Luc Hanouz¹¹, Emmanuelle Hammad¹², Bertrand Rozec¹³, Thomas Kerforne¹⁴, Carole Ichai¹⁵, Raphael Cinotti¹, Thomas Geeraerts², Djillali Elaroussi⁷, Paolo Pelosi¹⁶, Samir Jaber¹⁷, Marie Dalichampt¹⁸, Fanny Feuillet¹⁹, Véronique Sebillé^{18,19}, Antoine Roquilly¹ and The BI-VILI study group

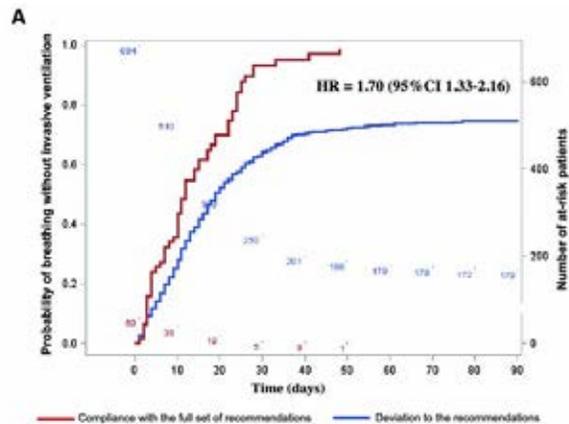
Strategy

- **low tidal volume (≤ 7 ml/kg),**
- **moderate PEEP (PEEP, 6–8 cm H₂O)**
- **Early extubation protocol**

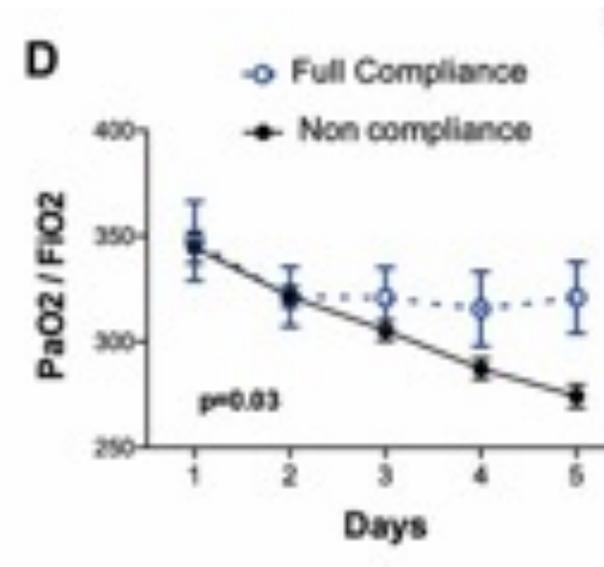
Extubation readiness

- **weaning from ventilation support**
- **effective cough**
- **GCS score of ≥ 10**

A total of 744 patients from 20 ICUs were included (391 pre-intervention; 353 intervention)



Number of iVFD was higher in the 60 (8%) patients with full compliance than in the 684 (92%) patients with deviation



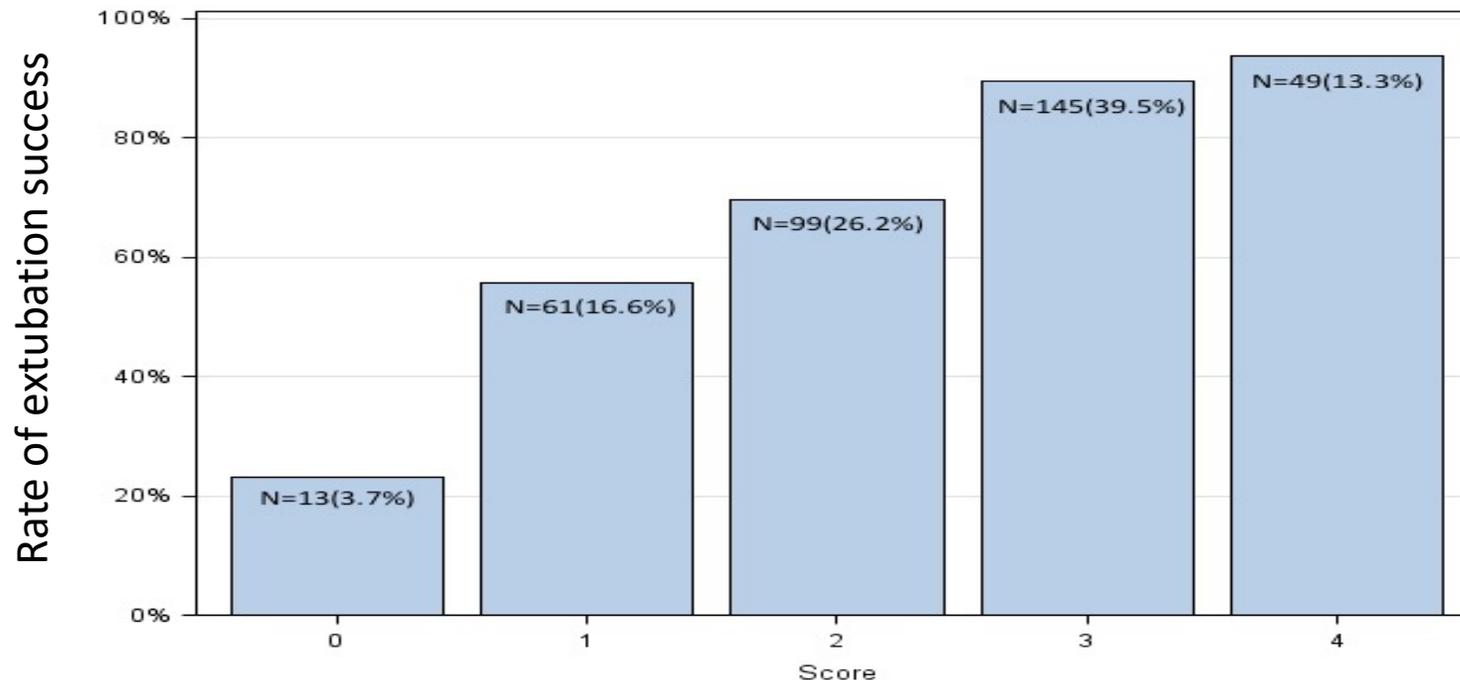
	Non compliance N=519	Compliance N=40	P value
Ventilator-free days D 90, mean (SD)	54 (±34)	68 (±25)	0.03
Mortality at day 90, N (%)	25 (26.1)	4 (10)	0.023

- **Multicenter study**
- **437 consecutive BI patients were included.**
- **338 (77.3%) extubations were successful.**



Clinical features	OR [CI _{95%}]	p
Age (<40 years old vs ≥ 40 years old)	2.27 [1.21-4.26]	0.0109
Visual pursuit	2.79 [1.61-4.82]	0.0002
Swallowing attempts	2.9 [1.67-5.03]	0.0001
Glasgow Coma Score (10 vs ≤10)	2.4 [1.38-4.18]	0.0019

Clinical factors associated with extubation success



A VISAGE score ≥ 3 was associated with 90% extubation success

Table 5. Score Calculation Worksheet

Factors	Points	
Airways management		
Cough	4	Upper airway functions
Deglutition	3	
Gag reflex	4	
Neurologic examination		
CRS-R item "visual"		Neurologic status
0-1-2	1	
3-4-5	3	
Total	14	

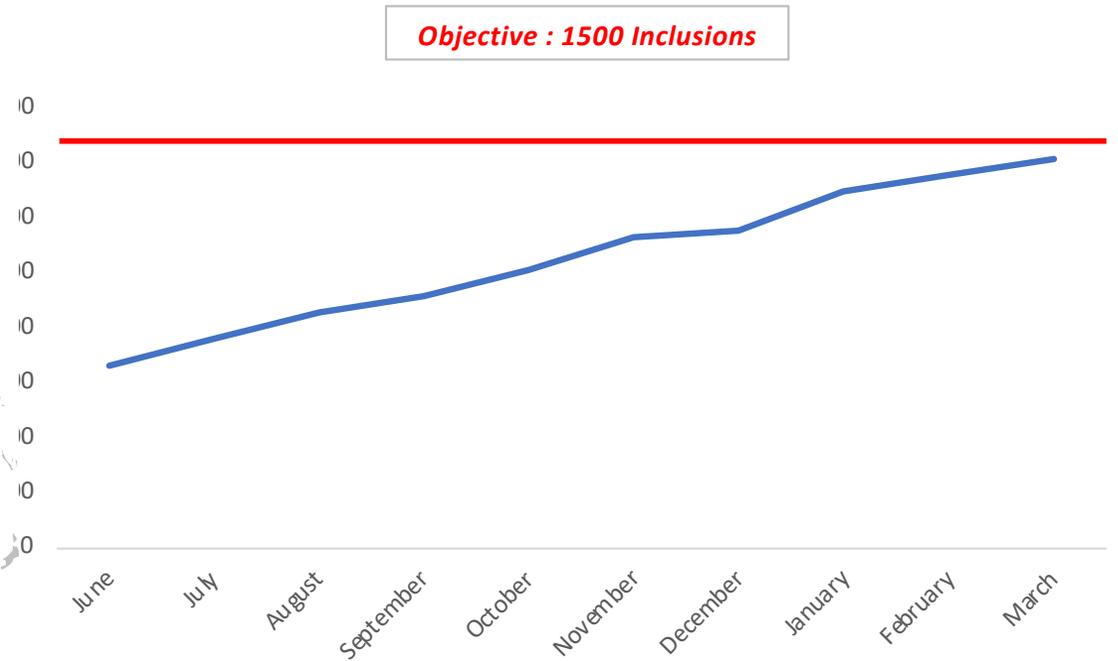
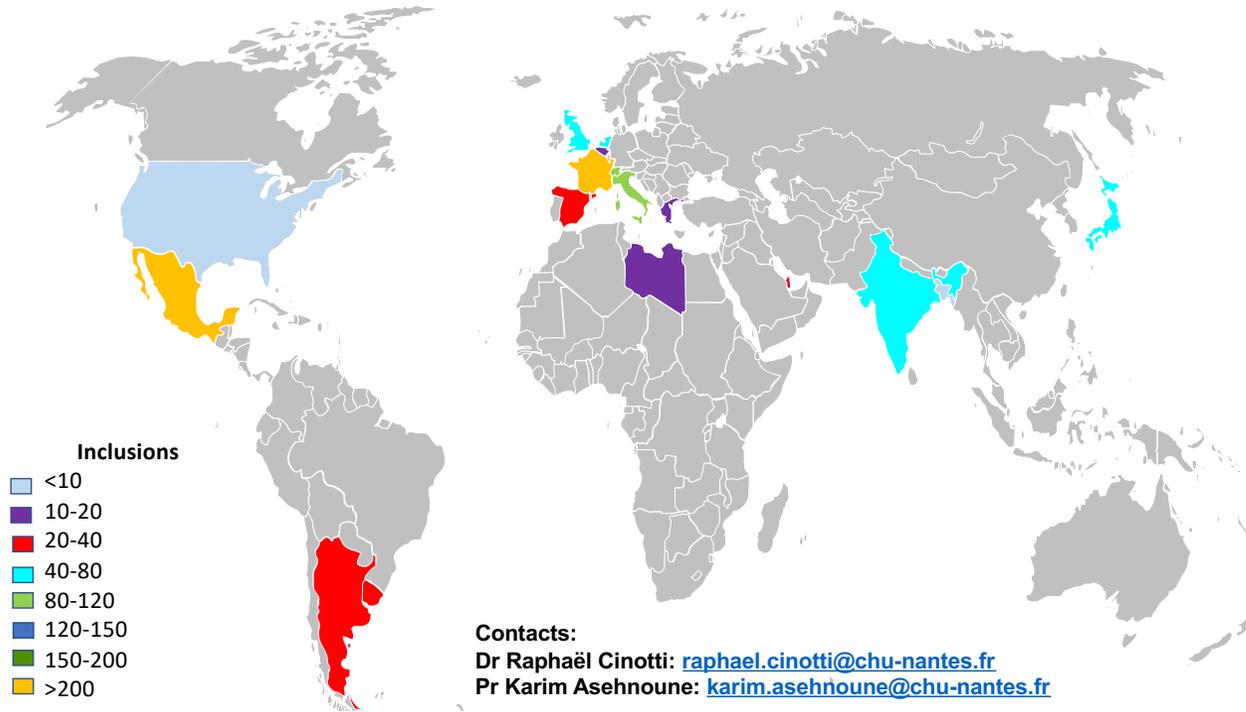
Low consciousness level patients
+
At least two operating airway functions
=
85% probability of extubation success

Conclusion

Methodological issues

- Monocentric studies
- Various definitions of failure/success
96 hours? / 7 days?
- Incomplete exploration of features (ex: gag reflex)
- No validation cohort

ENIO study



What we believed in...

	General population	Brain injury
V _t / PEEP	V _t 6-8 ml/kg PEEP > 3 mmHg	V _t > 10 ml/kg ZEEP
Extubation readiness criteria	Weaning + Cough (Occlusion pressure) + Swallowing	Non specific

Current knowledge

	General population	Brain injury
Tidal Volume / PEEP	Tidal volume 6-8 ml/kg PEEP > 3 mmHg	Tidal volume 6-8 ml/kg PEEP > 3 mmHg
Extubation readiness criteria	Weaning + Cough (Occlusion pressure) + Swallowing	Airway functions + Sub-optimal consciousness Level