CHU de RENNES

AER
ACTUALITÉS EN RÉANIMATION

Université de Rennes

SDRA :

Vers une prise en charge moins invasive ?

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Service de Médecine Intensive - Réanimation
CHU de Rennes

Conférencier:

- Fisher & Paykel

Support Logistique pour des congrès

- Gilead

Académique:

- IP d’un PHRCn “PROMILD”

Pourquoi se poser cette question ?

Epidemiology, Patterns of Care, and Mortality for Patients With Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries

JAMA®

Bellani et al. 2016

Table 5. Outcome of Invasively Ventilated Patients by Acute Respiratory Distress Syndrome Severity at Diagnosis

Parameter	All (n = 2377)	Mild (n = 714)	Moderate (n = 1106)	Severe (n = 557)	*P* Value[a]
Progression of ARDS severity, No (%) [95% CI][b]					
Progression to moderate[c]		184 (25.8) [22.6-29.1]	N/A	N/A	
Progression to severe[c]		32 (4.5) [3.1-6.3]	140 (12.7) [10.8-14.8]	N/A	
Death in the 1st wk without category change		63 (8.8) [6.8-11.1]	126 (11.4) [9.6-13.4]	117 (21.0) [17.7-24.6]	
Invasive ventilation-free days to day 28, median (IQR), d[d]	10 (0-22)	16 (0-24)	11 (0-21)	0 (0-18)	<.001
Duration of invasive ventilation, median (IQR), d					
All patients	8 (4-15)	7 (3-14)	8 (4-16)	9 (4-16)	.04
Surviving patients	8 (4-15)	6 (3-13)	8 (4-15)	11 (6-18)	<.001
ICU length of stay, median (IQR), d					
All patients	10 (5-20)	10 (5-19)	11 (6-20)	11 (5-19)	.39
Surviving patients	11 (7-21)	10 (6-19)	12 (7-21)	14 (7-23)	.03
ICU mortality, No. (%) [95% CI]	838 (35.3) [33.3-37.2]	212 (29.7) [26.4-33.2]	387 (35.0) [32.2-37.9]	239 (42.9) [38.8-47.1]	<.001
Day 28 mortality, No. (%) [95% CI]	828 (34.8) [32.9-36.8]	211 (29.6) [26.2-33.0]	389 (35.2) [32.4-38.1]	228 (40.9) [36.8-45.1]	<.001
Hospital length of stay, median (IQR), d					
All patients	17 (8-33)	18 (10-33)	17 (8-33)	16 (6-31)	.22
Surviving patients	23 (14-40)	23 (14-40)	22 (13-40)	26 (14-43)	.41
Hospital mortality, No. (%) [(95% CI]	952 (40.0) [38.1-42.1]	249 (34.9) [31.4-38.5]	446 (40.3) [37.4-43.3]	257 (46.1) [41.9-50.4]	<.001

29 144 patients

4 499 admis pour IRA

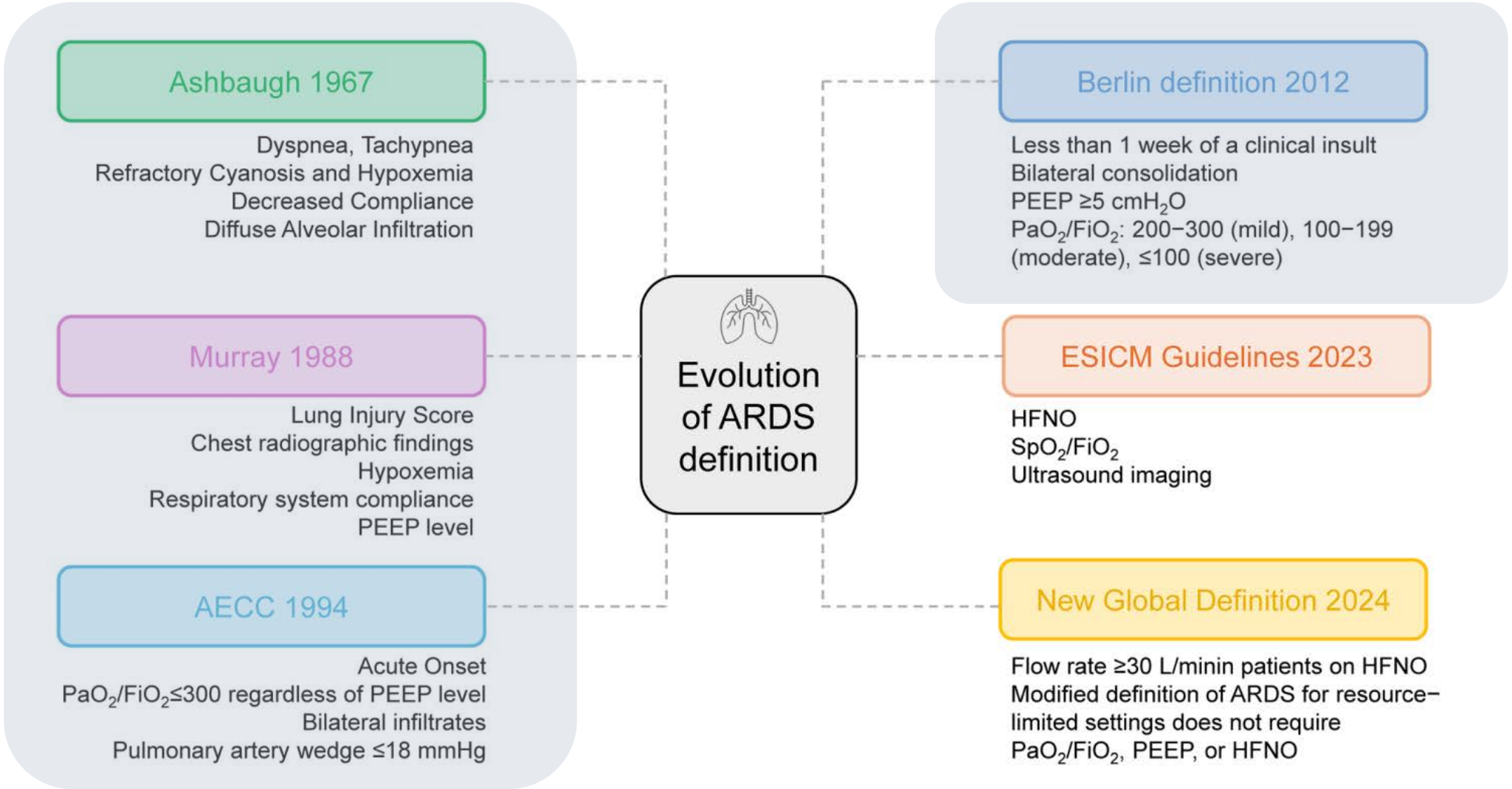
N= 2377

10.4 % des admissions

8 jours de ventilation mécanique

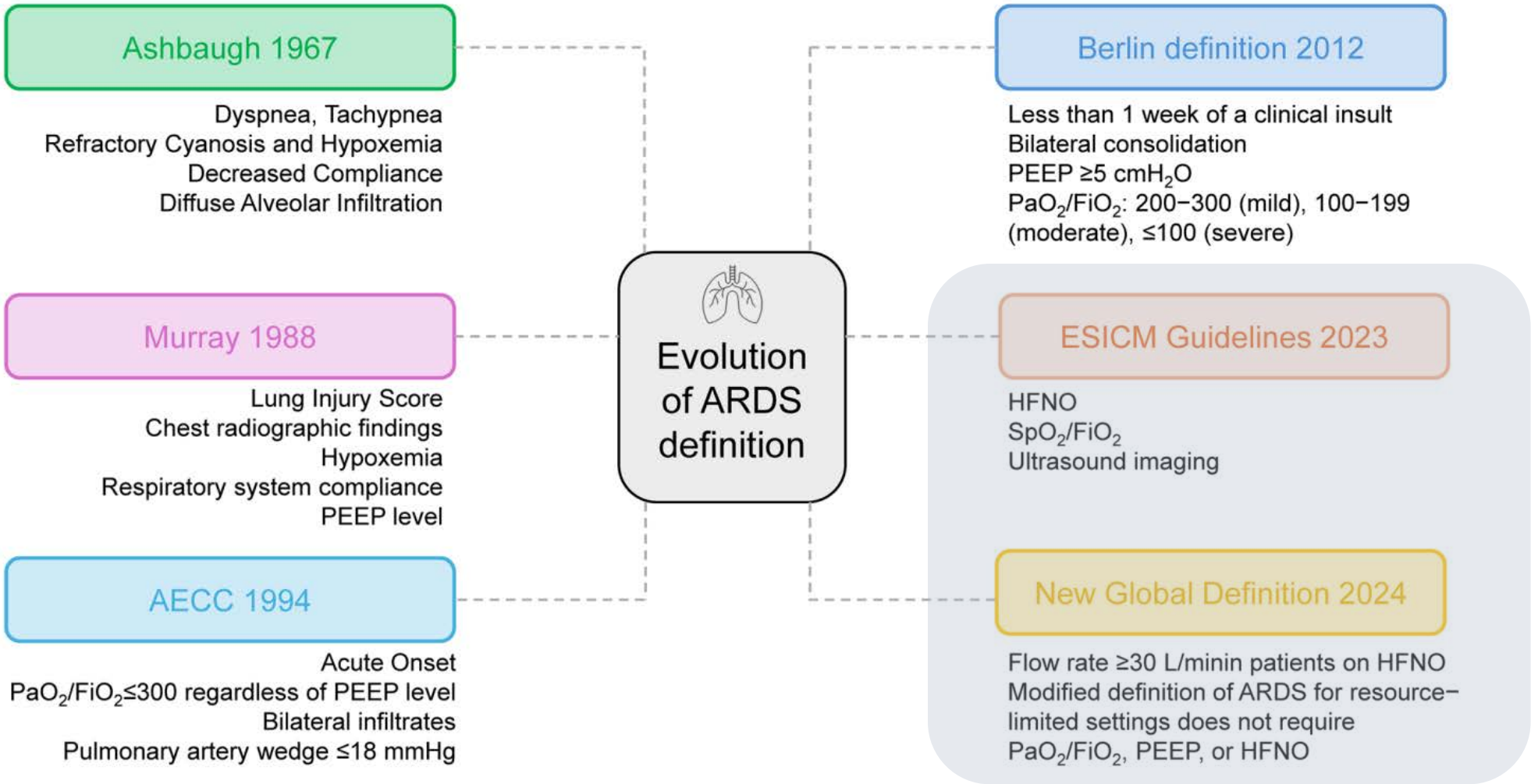
34.8% mortalité à J28

Evolution de la définition



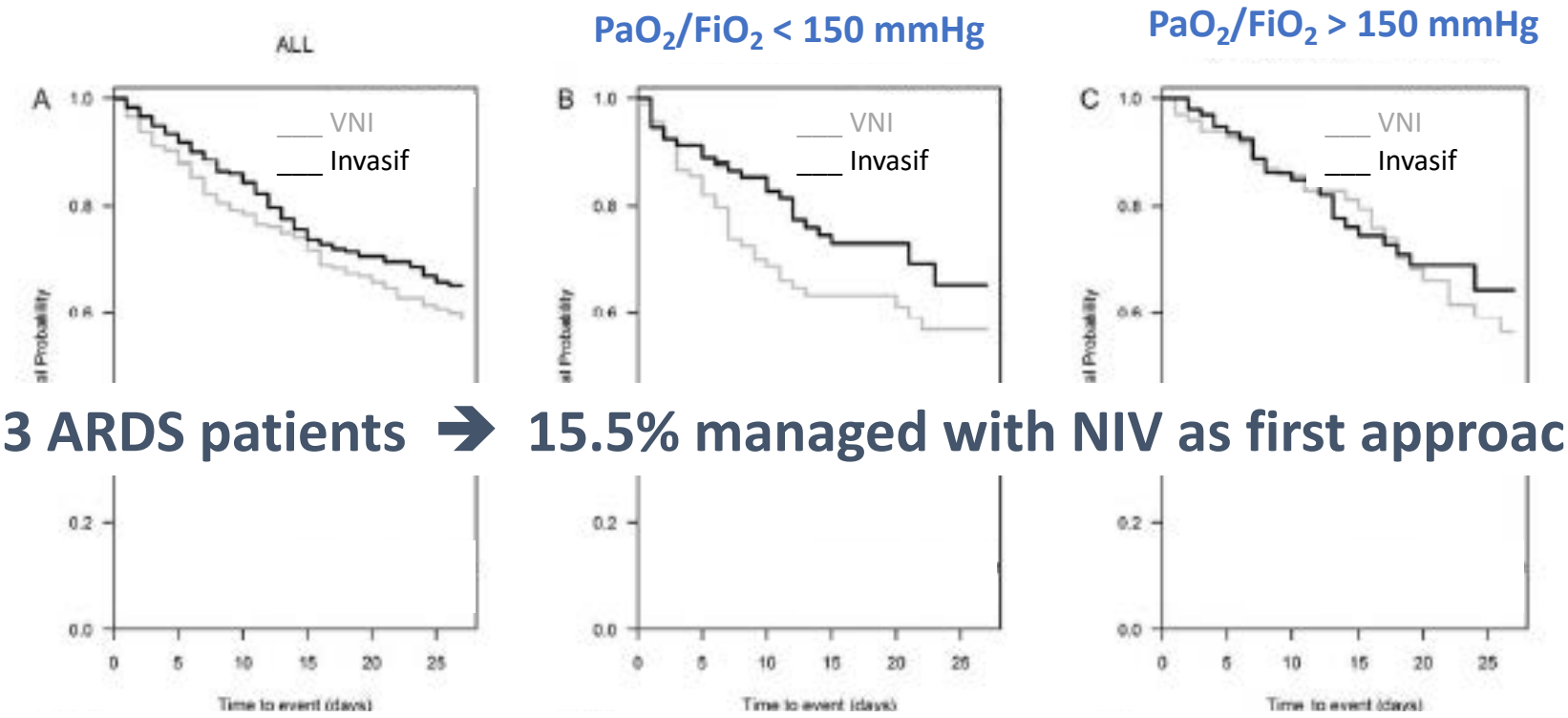
Al-Husinat *et al. Critical Care* (2025) 29:88

Evolution de la définition



Al-Husinat *et al. Critical Care* (2025) 29:88

Lungsafe NIV study



2813 ARDS patients ➔ 15.5% managed with NIV as first approach

Propensity matched analysis: ↑ ICU mortality c/o NIV vs intubation if PaO_2/FIO_2 < 150

Bellani G, et al. AJRCCM 2017

♂

51 ans

ATCD:
Aucun

Sportif
4 enfants

IRA

Hiver 2024

GDS : pH 7.38

PaO_2 : 61 mmHg

$PaCO_2$: 41 mmHg

Lactate : 1.7 mmol/l

SpO_2 : 93%

15 L/min d'O_2

Polypnée à 24 cycles/min

Discret tirage sus sternal

Que se passe t'il en cas IRA ? – Quelles sont les conséquences physiologiques ?

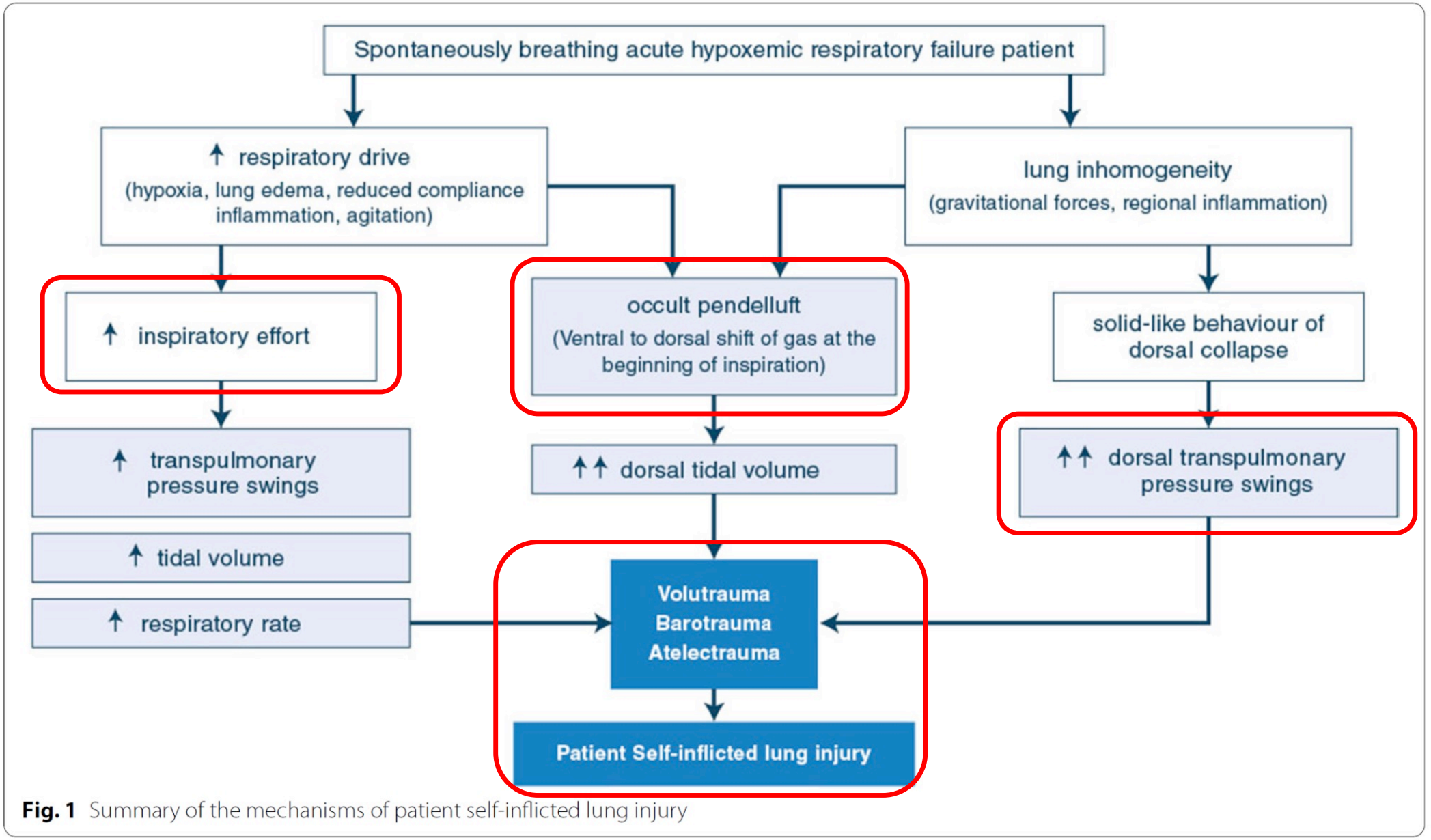
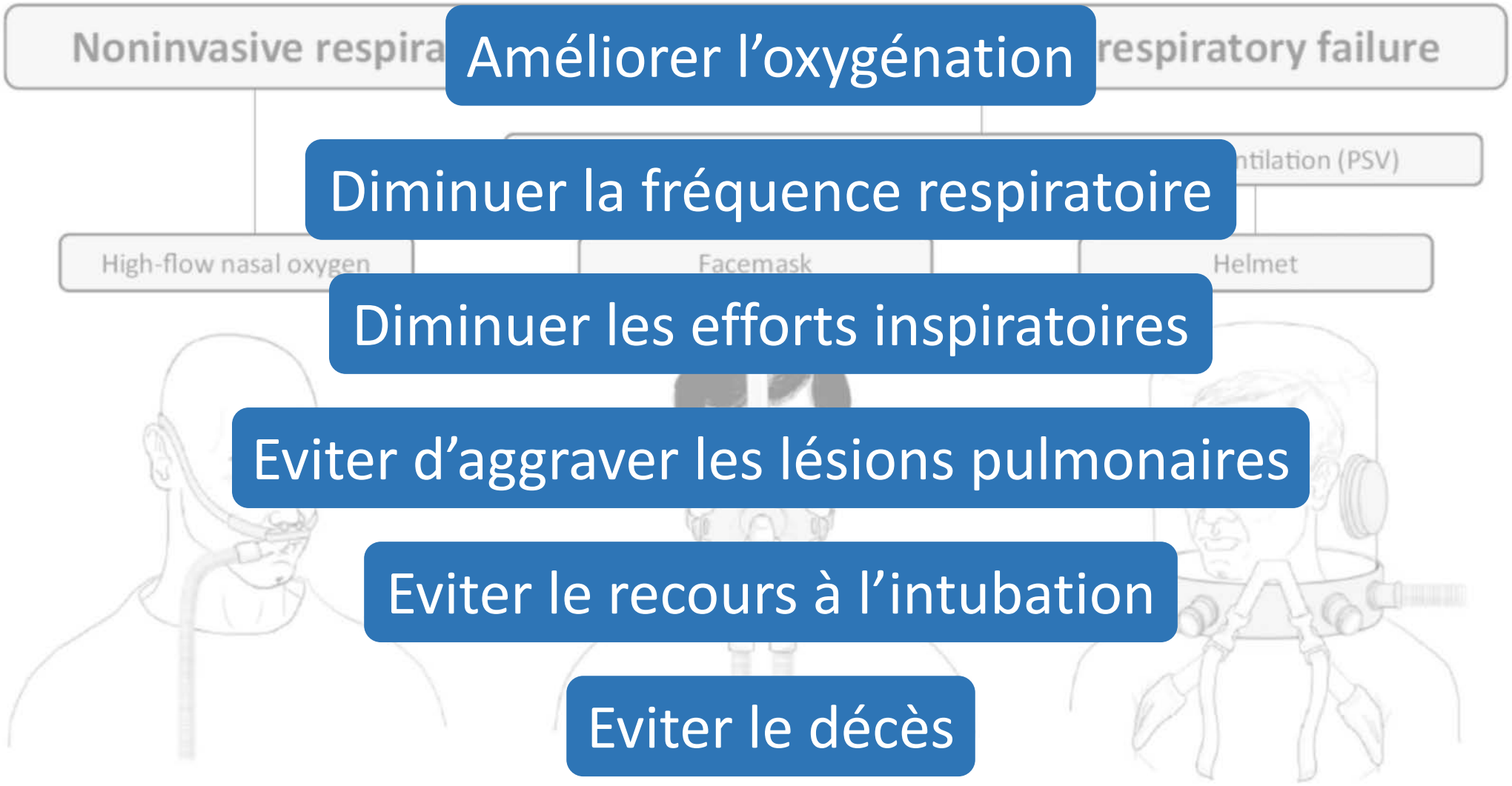


Fig. 1 Summary of the mechanisms of patient self-inflicted lung injury

Qu’attend-on d’une oxygénation non invasive ?



Améliorer l’oxygénation

Diminuer la fréquence respiratoire

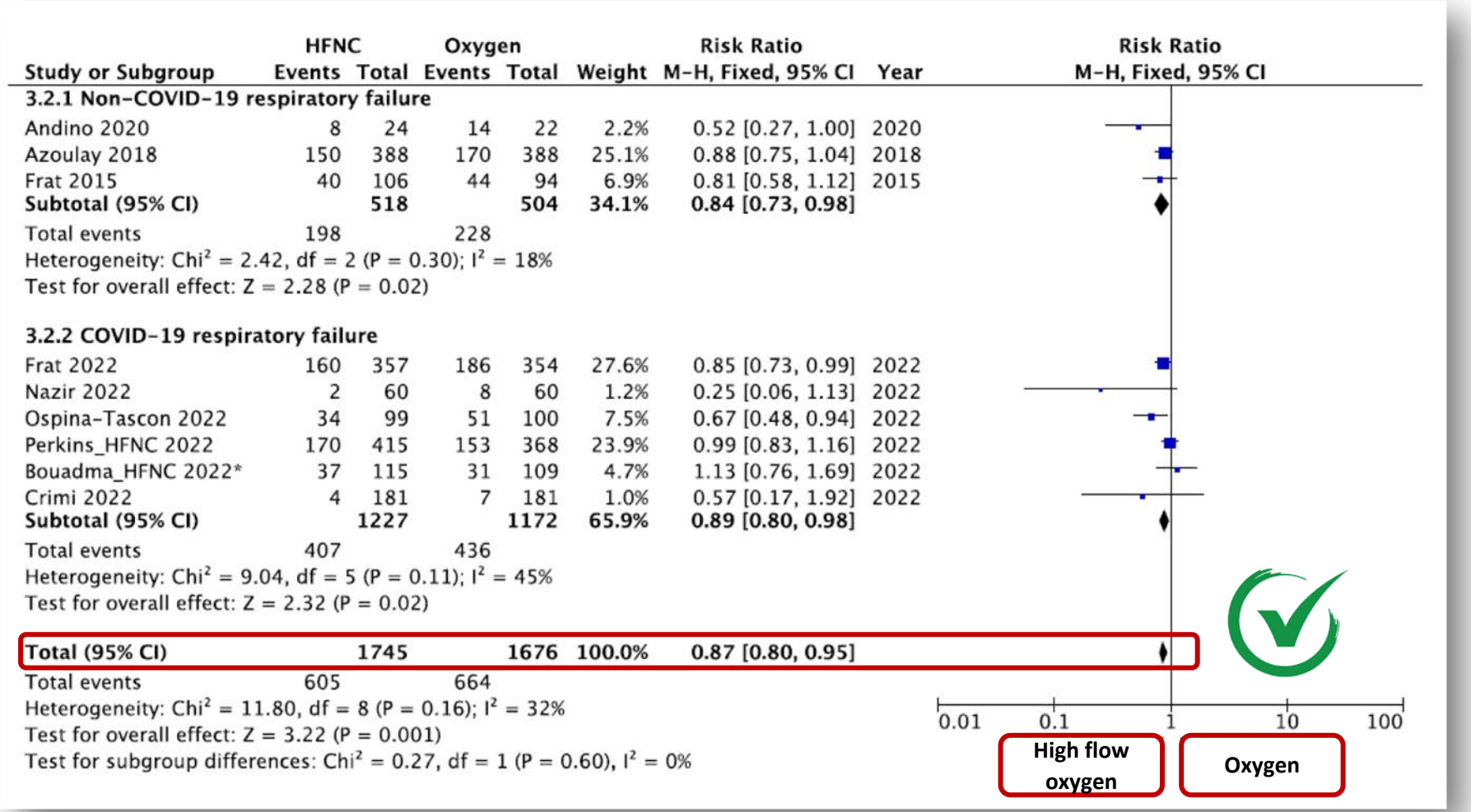
Diminuer les efforts inspiratoires

Eviter d’aggraver les lésions pulmonaires

Eviter le recours à l’intubation

Eviter le décès

Quelles sont les données de la littérature ?



Study or Subgroup	HFNC Events	HFNC Total	Oxygen Events	Oxygen Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
3.2.1 Non-COVID-19 respiratory failure							
Andino 2020	8	24	14	22	2.2%	0.52 [0.27, 1.00]	2020
Azoulay 2018	150	388	170	388	25.1%	0.88 [0.75, 1.04]	2018
Frat 2015	40	106	44	94	6.9%	0.81 [0.58, 1.12]	2015
Subtotal (95% CI)		**518**		**504**	**34.1%**	**0.84 [0.73, 0.98]**	
Total events	198		228				
Heterogeneity: $Chi^2 = 2.42$, df = 2 (P = 0.30); $I^2 = 18\%$							
Test for overall effect: Z = 2.28 (P = 0.02)							
3.2.2 COVID-19 respiratory failure							
Frat 2022	160	357	186	354	27.6%	0.85 [0.73, 0.99]	2022
Nazir 2022	2	60	8	60	1.2%	0.25 [0.06, 1.13]	2022
Ospina-Tascon 2022	34	99	51	100	7.5%	0.67 [0.48, 0.94]	2022
Perkins_HFNC 2022	170	415	153	368	23.9%	0.99 [0.83, 1.16]	2022
Bouadma_HFNC 2022*	37	115	31	109	4.7%	1.13 [0.76, 1.69]	2022
Crimi 2022	4	181	7	181	1.0%	0.57 [0.17, 1.92]	2022
Subtotal (95% CI)		**1227**		**1172**	**65.9%**	**0.89 [0.80, 0.98]**	
Total events	407		436				
Heterogeneity: $Chi^2 = 9.04$, df = 5 (P = 0.11); $I^2 = 45\%$							
Test for overall effect: Z = 2.32 (P = 0.02)							
Total (95% CI)		**1745**		**1676**	**100.0%**	**0.87 [0.80, 0.95]**	
Total events	605		664				
Heterogeneity: $Chi^2 = 11.80$, df = 8 (P = 0.16); $I^2 = 32\%$							
Test for overall effect: Z = 3.22 (P = 0.001)							
Test for subgroup differences: $Chi^2 = 0.27$, df = 1 (P = 0.60), $I^2 = 0\%$							

Recours à l'intubation

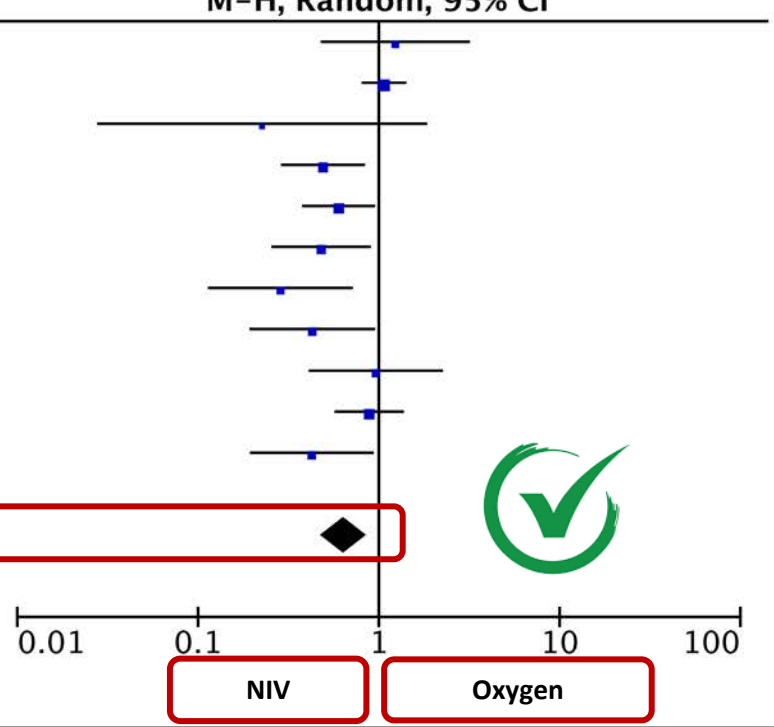
Helms Ann Intensive Care 2024

Quelles sont les données de la littérature ?

Study or Subgroup	NIV Events	NIV Total	Oxygen Events	Oxygen Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
He 2019	9	102	7	98	6.2%	1.24 [0.48, 3.19]	2019
Frat 2015	55	110	44	94	15.9%	1.07 [0.80, 1.42]	2015
Zhan 2005	1	21	4	19	1.7%	0.23 [0.03, 1.85]	2005
Ferrer 2003	13	51	28	54	11.4%	0.49 [0.29, 0.84]	2003
Hilbert 2001	12	26	20	26	12.6%	0.60 [0.38, 0.96]	2001
Martin 2000	9	32	17	29	9.9%	0.48 [0.25, 0.90]	2000
Antonelli 2000	4	20	14	20	6.4%	0.29 [0.11, 0.72]	2000
Confalonieri 1999	6	28	14	28	7.7%	0.43 [0.19, 0.95]	1999
Wood 1998	7	16	5	11	7.1%	0.96 [0.41, 2.26]	1998
Wysocki 1995	13	21	14	20	13.1%	0.88 [0.57, 1.38]	1995
Kramer 1995	5	16	11	15	7.8%	0.43 [0.19, 0.94]	1995
Total (95% CI)		**443**		**414**	**100.0%**	**0.64 [0.48, 0.85]**	
Total events	134		178				

Heterogeneity: $Tau^2 = 0.12$; $Chi^2 = 22.68$, df = 10 (P = 0.01); $I^2 = 56\%$

Test for overall effect: Z = 3.07 (P = 0.002)



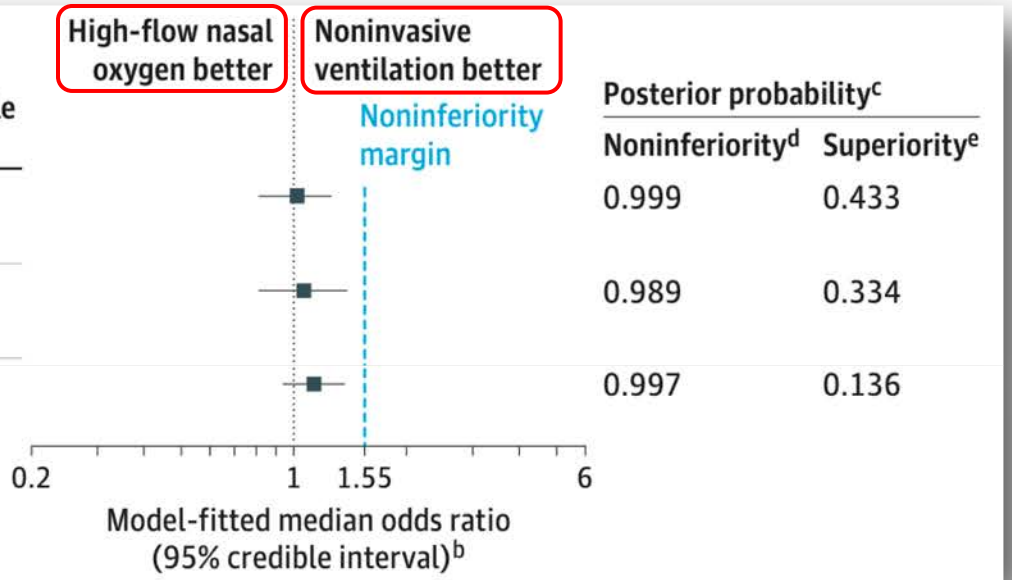
High-Flow Nasal Oxygen vs Noninvasive Ventilation in Patients With Acute Respiratory Failure

The RENOVATE Randomized Clinical Trial

Original Investigation | Caring for the Critically Ill Patient

December 10, 2024

Patients with acute respiratory failure	No./total (%)		Model-fitted median odds ratio (95% credible interval)[b]	Posterior probability[c]	
	High-flow nasal oxygen	Noninvasive ventilation		Noninferiority[d]	Superiority[e]
Nonimmunocompromised with hypoxemia	81/249 (32.5)	78/236 (33.1)	1.02 (0.81-1.26)	0.999	0.433
Immunocompromised with hypoxemia	16/28 (57.1)	8/22 (36.4)	1.07 (0.81-1.39)	0.989	0.334
Hypoxemic COVID-19	223/435 (51.3)	210/447 (47.0)	1.13 (0.94-1.38)	0.997	0.136



Intubation or death at D7 OHD (n = 883) or NIV (n = 883)

Cavalcanti JAMA 2024

Pas de rationnel à utiliser plus la VNI que l'OHD

JAMA | Original Investigation

Effect of Noninvasive Respiratory Strategies on Intubation or Mortality Among Patients With Acute Hypoxemic Respiratory Failure and COVID-19

The RECOVERY-RS Randomized Clinical Trial

Gavin D. Perkins, MD; Chen Ji, PhD; Bronwen A. Connolly, PhD; Keith Couper, PhD; Ranjit Lall, PhD; J. Kenneth Baillie, PhD; Judy M. Bradley, PhD; Paul Dark, PhD; Chirag Dave, MD; Anthony De Soyza, PhD; Anna V. Dennis, MBBS; Anne Devrell, BPhil; Sara Fairbairn, MB, BCh; Hakim Ghani, MSc; Ellen A. Gorman, MB, BCh; Christopher A. Green, DPhil; Nicholas Hart, PhD; Siew Wan Hee, PhD; Zoe Kimbley, MB, ChB; Shyam Madathil, MD; Nicola McGowan, MRes; Benjamin Messer, MA; Jay Naisbitt, MB, ChB; Chloe Norman, PGCE; Dhruv Parekh, PhD; Emma M. Parkin, MSc; Jaimin Patel, PhD; Scott E. Regan, BA; Clare Ross, MBBS; Anthony J. Rostron, PhD; Mohammad Saim, MBBS; Anita K. Simonds, MD; Emma Skilton, BSc; Nigel Stallard, PhD; Michael Steiner, MD; Rama Vancheeswaran, PhD; Joyce Yeung, PhD; Daniel F. McAuley, MD; for the RECOVERY-RS Collaborators

Perkins et al. JAMA 2022; 327: 546-58

	CPAP N=377	O_2 N=356	
Primary composite outcome			
Tracheal intubation or mortality within 30 d, No./total (%)	137/377 (36.3)	158/356 (44.4)	
Secondary outcomes			
Individual components of the primary composite			
Intubation	**33%**	**41%**	**P=0.03**
Tracheal intubation rate, No./total (%)[d]	126/377 (33.4)	147/356 (41.3)	
Admission to intensive care unit, No./total (%)	204/368 (55.4)	219/348 (62.9)	
Duration of invasive mechanical ventilation after tracheal intubation, median (IQR), d[e]	(n = 126) 15.0 (8.0 to 25.0)	(n = 147) 11.0 (6.0 to 23.0)	
Time to event, median (IQR), d			
Mortality in ICU	30%	30%	NS
	17.0 (11.0 to 26.0)	17.0 (11.0 to 24.0)	
Mortality, No./total (%)			
During intensive care unit stay	62/204 (30.4)	66/219 (30.1)	
During hospital stay	72/364 (19.8)	78/346 (22.5)	
Length of stay, mean (SD), d			
Intensive care unit[h]	(n = 368) 9.5 (15.6)	(n = 348) 9.6 (13.6)	
Hospital[i]	(n = 364) 16.4 (17.5)	(n = 346) 17.3 (18.1)	

15% des patients groupe CPAP ont changé de traitement

Perkins et al. JAMA 2022; 327: 546-58

Projet HighCPAP

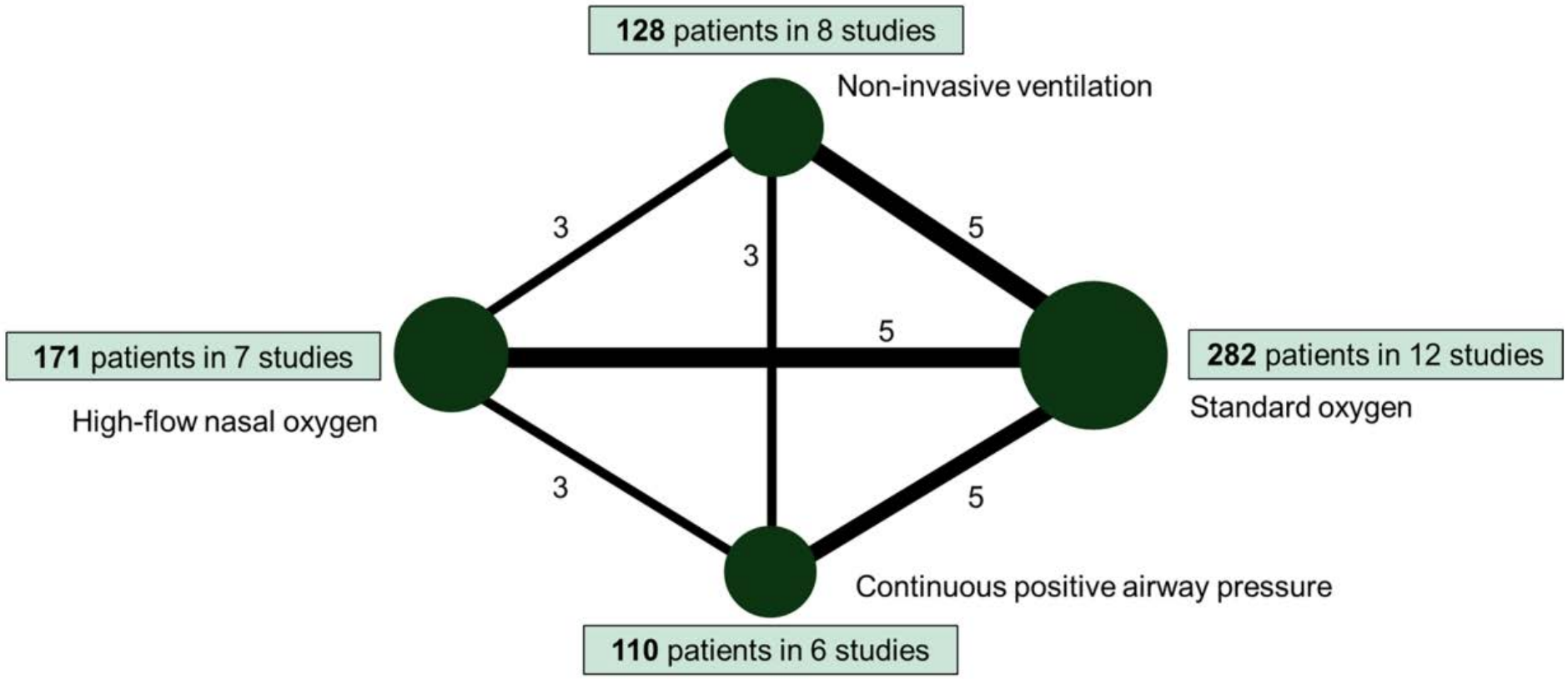
Insuffisance respiratoire aiguë hypoxémique

OHD

CPAP

Physiological effects of noninvasive respiratory support strategies in adults with acute hypoxemic respiratory failure: a systematic review and network meta-analysis

Menga *et al. Critical Care* (2025) 29:456
https://doi.org/10.1186/s13054-025-05670-7



Menga Crit Care 2025

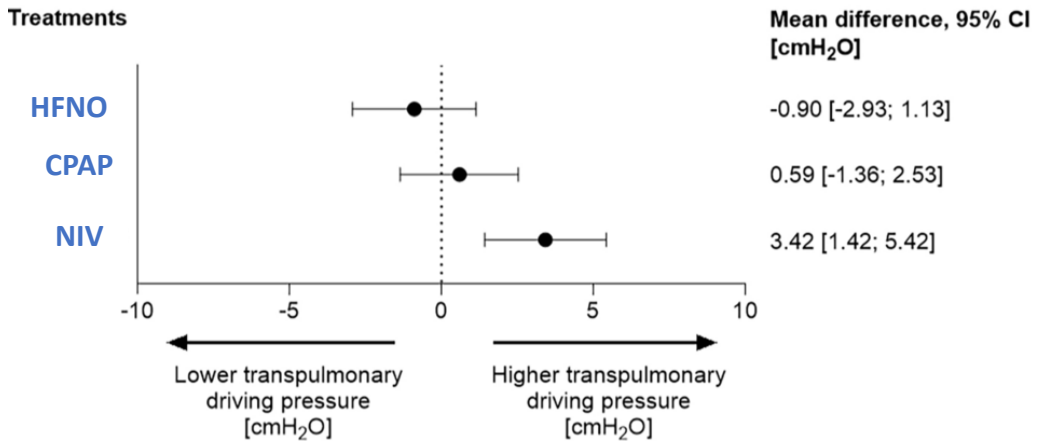
Physiological effects of noninvasive respiratory support strategies in adults with acute hypoxemic respiratory failure: a systematic review and network meta-analysis

Menga *et al. Critical Care* (2025) 29:456
https://doi.org/10.1186/s13054-025-05670-7

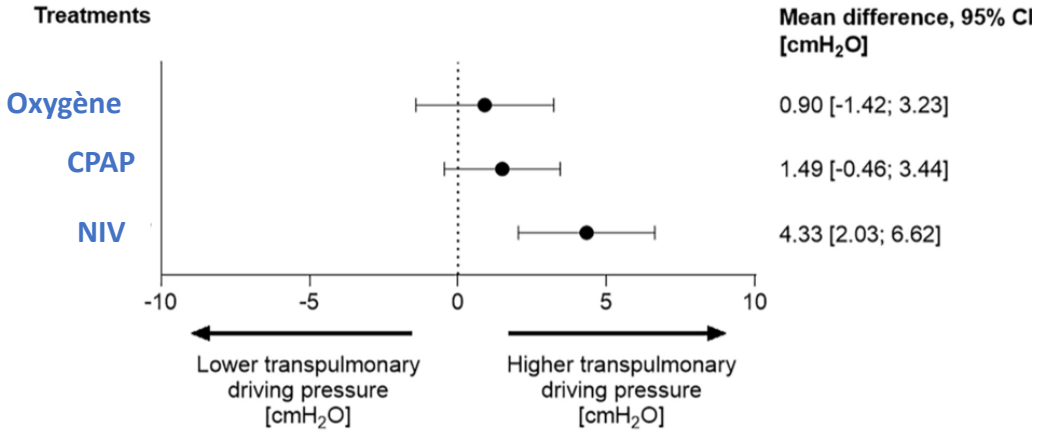
CRITICAL CARE

Transpulmonary driving pressure

Oxygène Standard = Reference

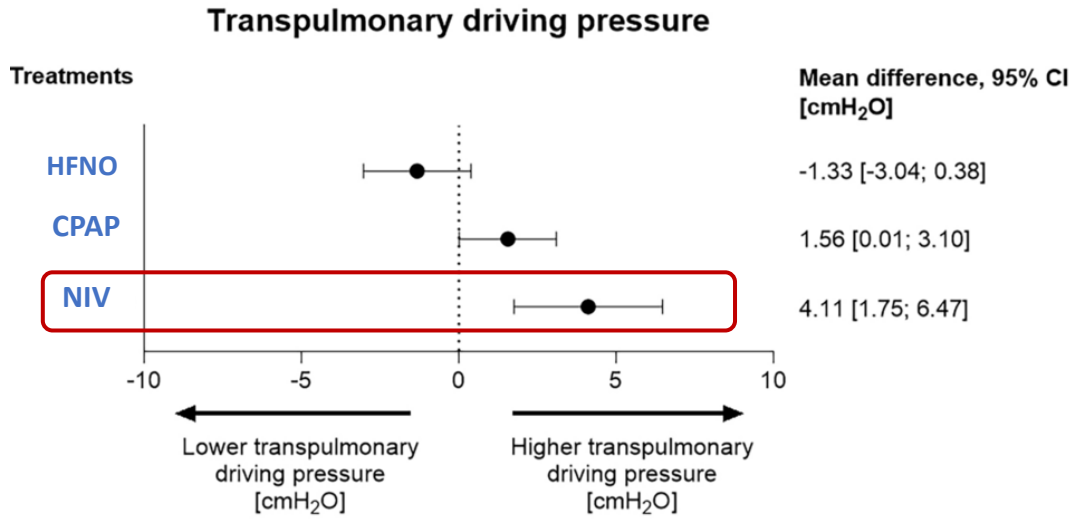


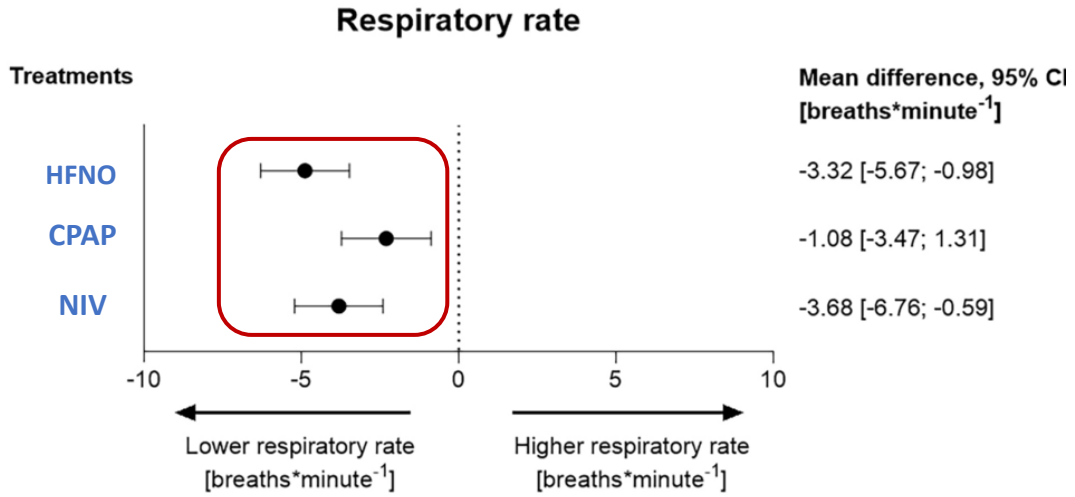
HFNO = Reference

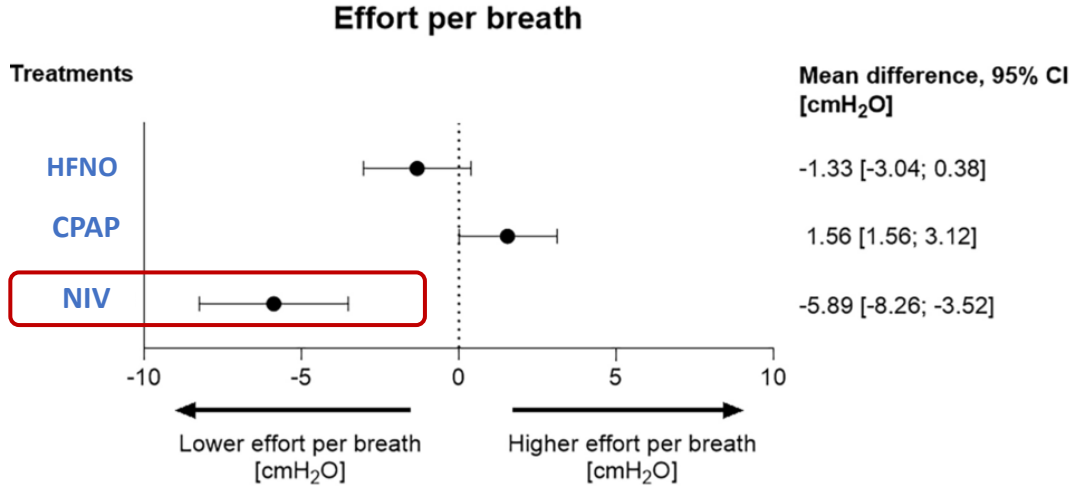


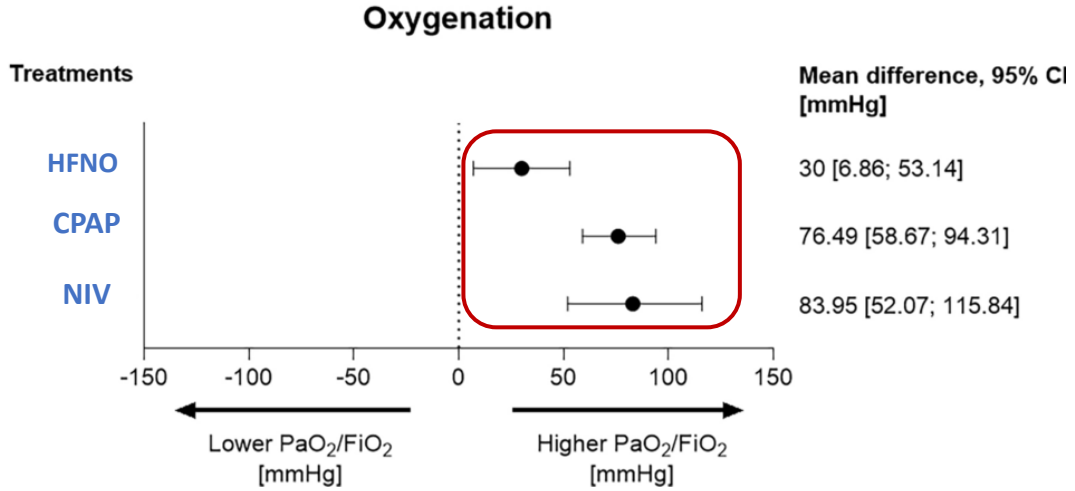
Menga Crit Care 2025

Sensitivity analysis





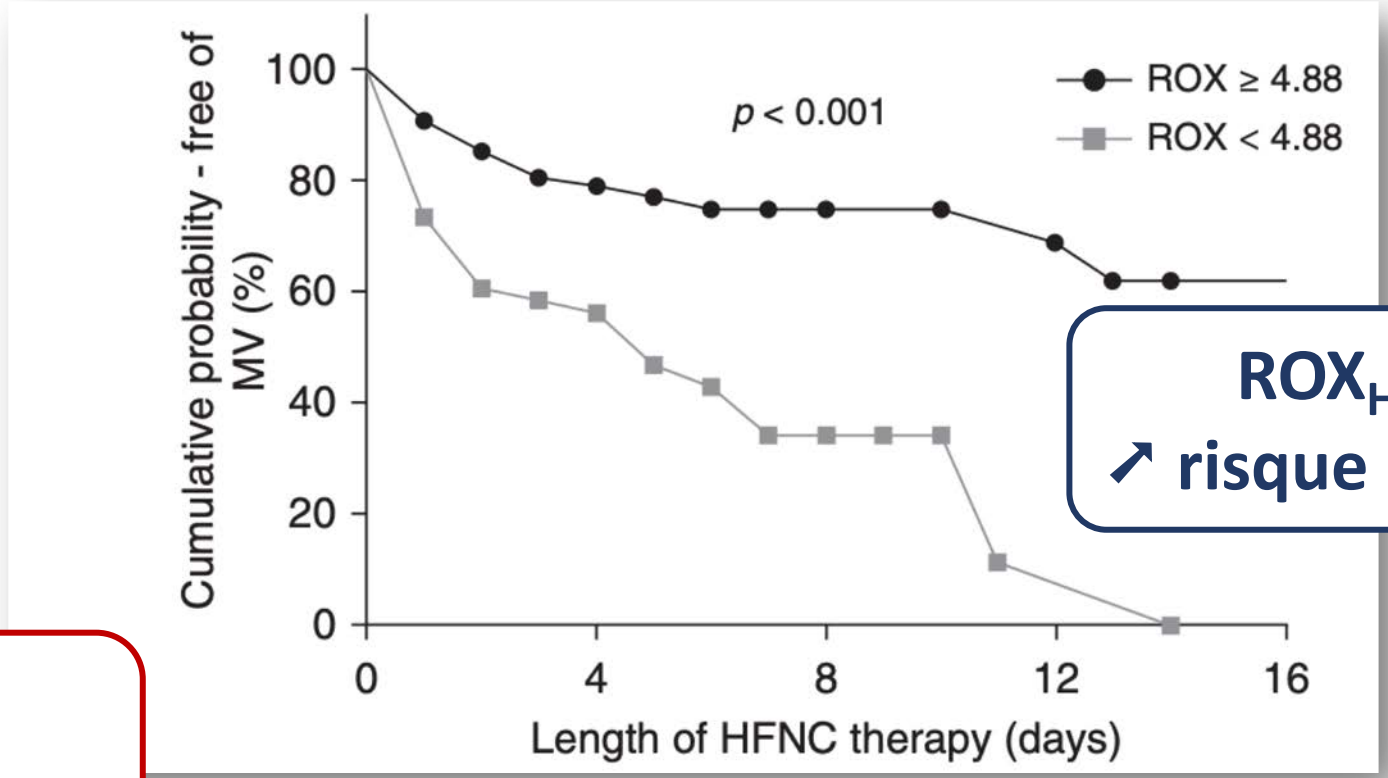




Menga Crit Care 2025

Nécessité d'une surveillance de la méthode d'oxygénation

ROX index = $\mathrm{SpO_2}/\mathrm{FiO_2}/\mathrm{RR}$



$\mathrm{ROX_{H+6}}$ < 4.88
↗ risque d'intubation

⚠

$\mathrm{SpO_2}$ ≤ 97%
Seuils ≠ pour ID, COVID

Roca Am J Respir Crit Care Med 2019

Nécessité d'une surveillance de la méthode d'oxygénation

Le score HACOR

NIV time points	AUC (95% CI)	Cutoff point
1 h of NIV ($N = 807$)	0.89 (0.87–0.91)	>5

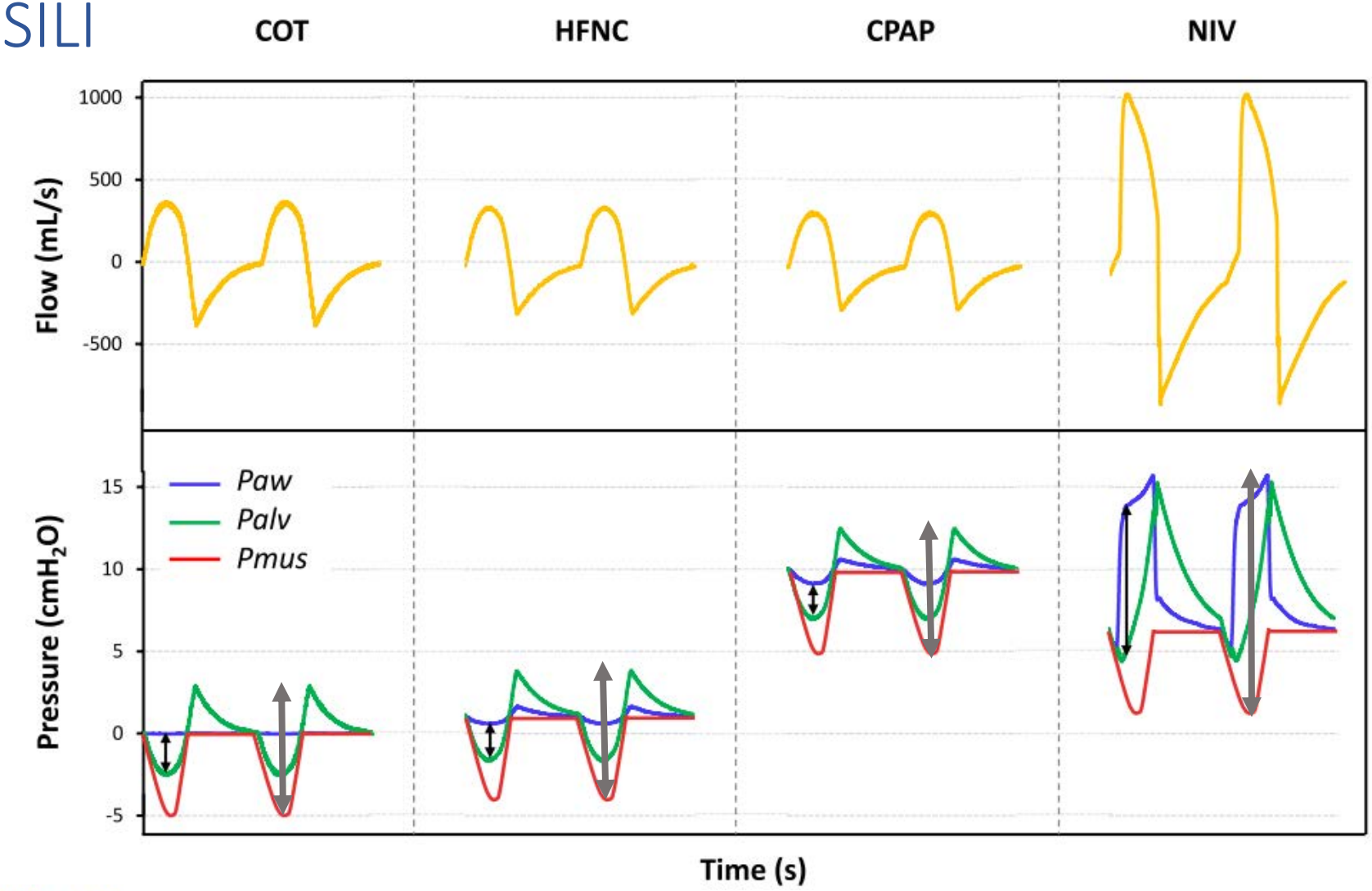
Plus que le score, les variables à surveiller sont intéressantes

FC (/min)	≤120	0
	≥121	1
pH	≥7.35	0
	7.30–7.34	2
	7.25–7.29	3
	<7.25	4
GCS	15	0
	13–14	2
	11–12	5
	≤10	10
PaO_2/FiO_2	≥201	0
	176–200	2
	151–175	3
	126–150	4
	101–125	5
	≤100	6
FR (/min)	≤30	0
	31–35	1
	36–40	2
	41–45	3
	≥46	4

Duan Intensive Care Med 2016

Nécessité d'une surveillance de la méthode d'oxygénation

Eviter le P-SILI

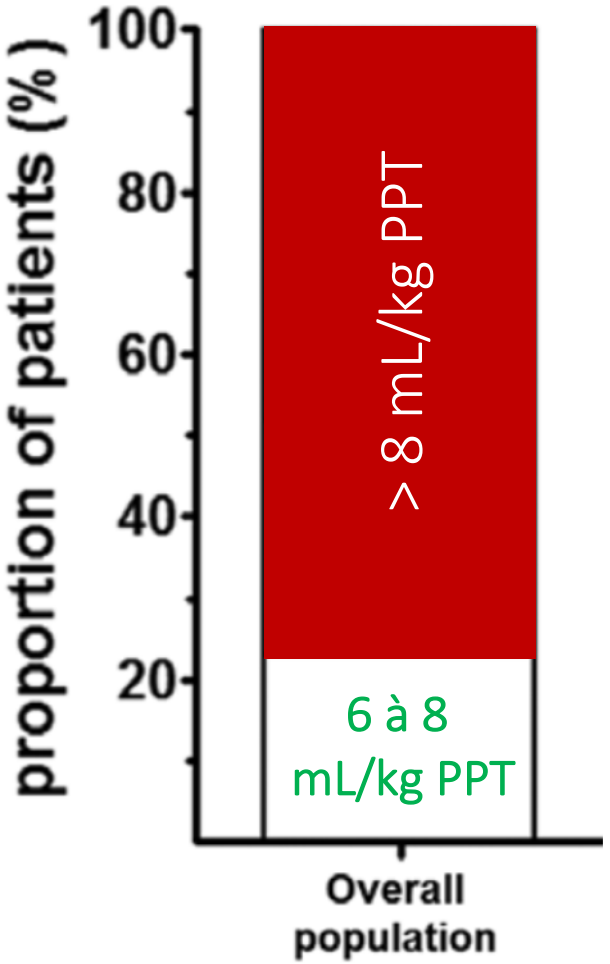


Intensive Care Med (2025) 51:1476–1489
https://doi.org/10.1007/s00134-025-08036-3

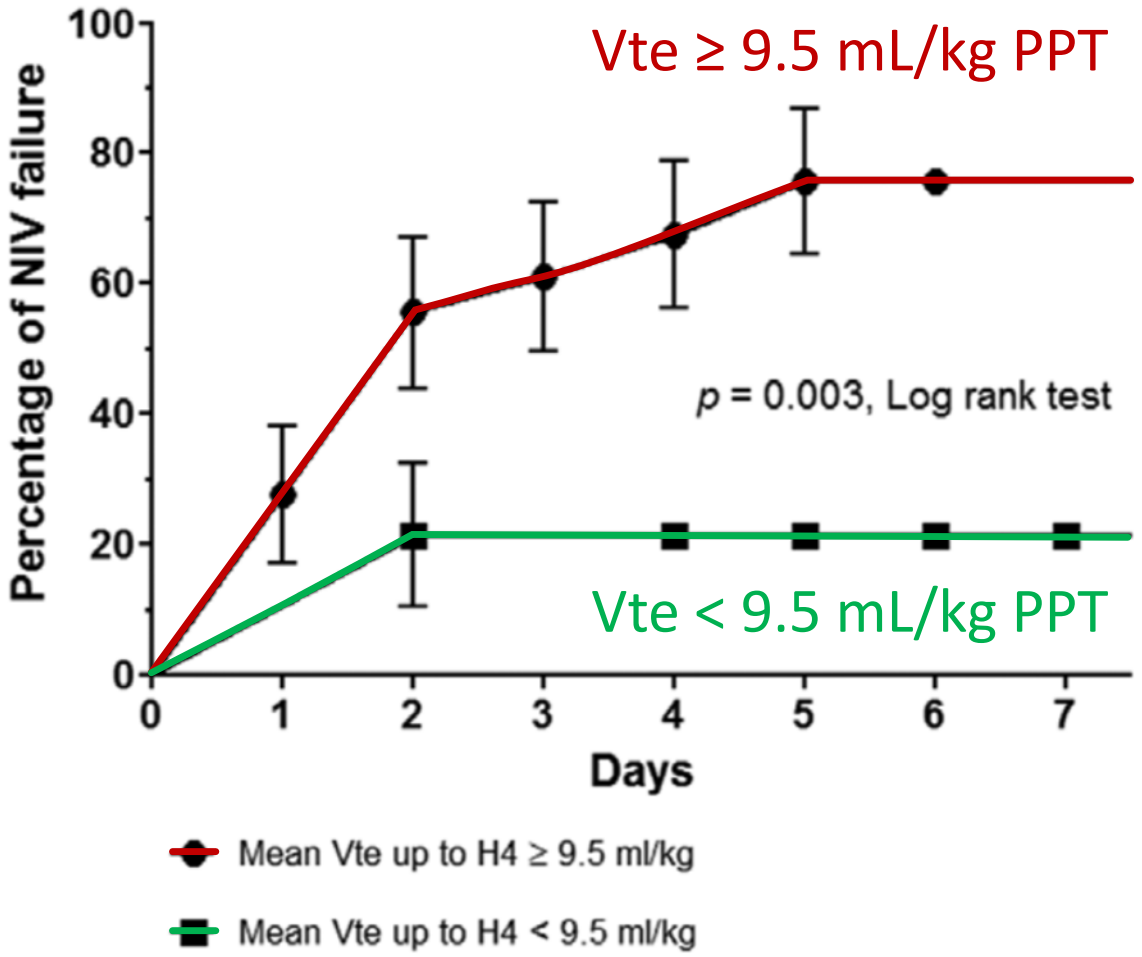
Frat Intensive Care Med 2025

Nécessité d'une surveillance de la méthode d'oxygénation

Grands volumes sous VNI



75% infiltrats bilatéraux



N=62

Carteaux Crit Care Med 2016

Nécessité d'une surveillance de la méthode d'oxygénation

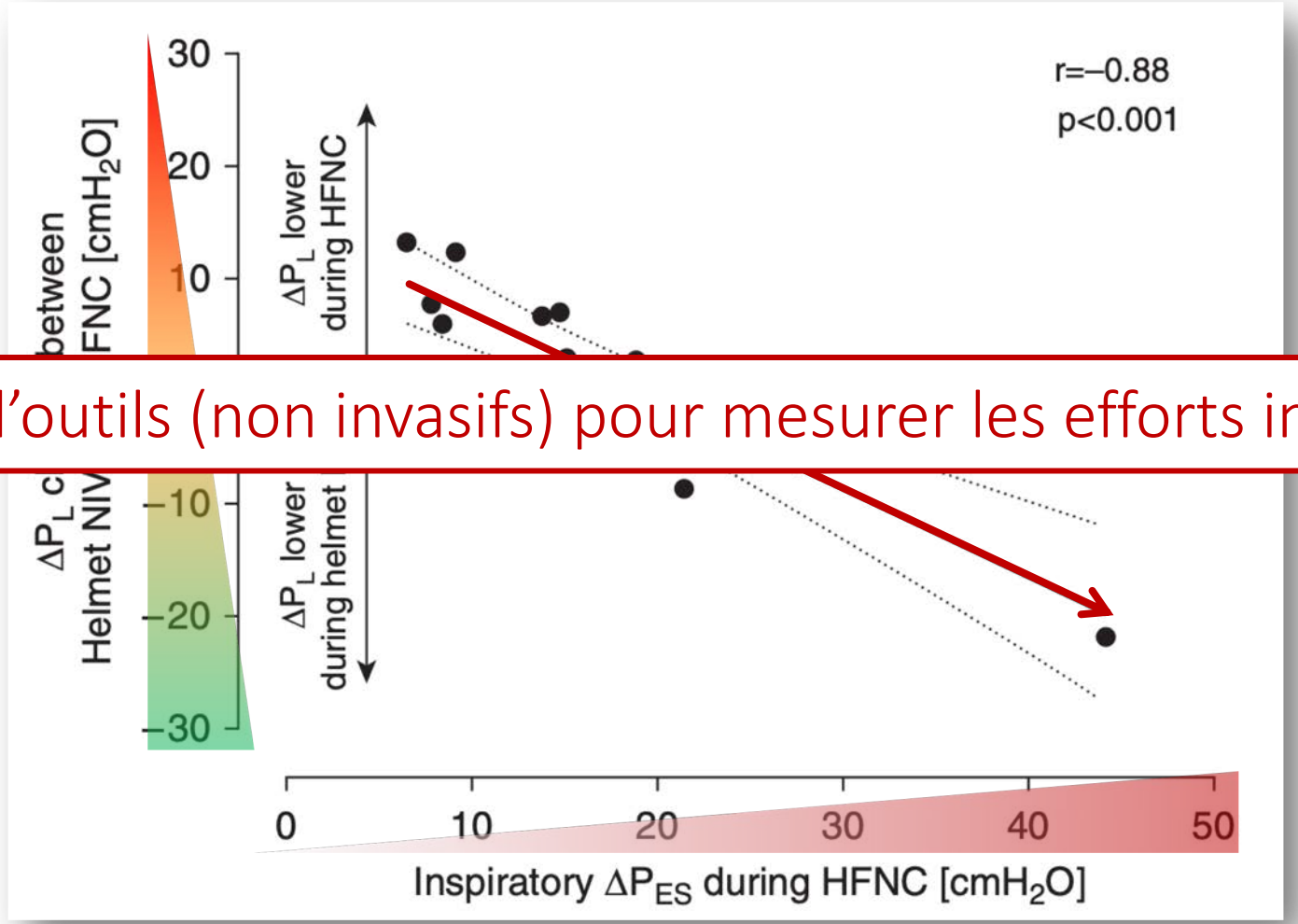
Tolérance

Facteurs associés au succès VNI (n=855)	Adjusted OR (95% CI)	P value
NIV 2010/2011 (*vs.* 1997 & 2002)	2.0 (1.4-2.9)	< 0.001
PaO_2/FiO_2, per 25 mmHg increase	25.1 (25.0-25.1)	0.004
Good NIV tolerance	2.8 (1.7-4.4)	< 0.001
SAPS II, per point	0.9 (0.9-1.0)	< 0.001
High level of leaks	0.4 (0.2-0.8)	0.012
de novo ARF	0.5 (0.3-0.5)	< 0.001

Demoule Intensive Care Med 2016

Comment progresser ?

Perspectives: personnalisation des traitements?



Nécessité d'outils (non invasifs) pour mesurer les efforts inspiratoires

Grieco Am J Respir Crit Care Med 2020

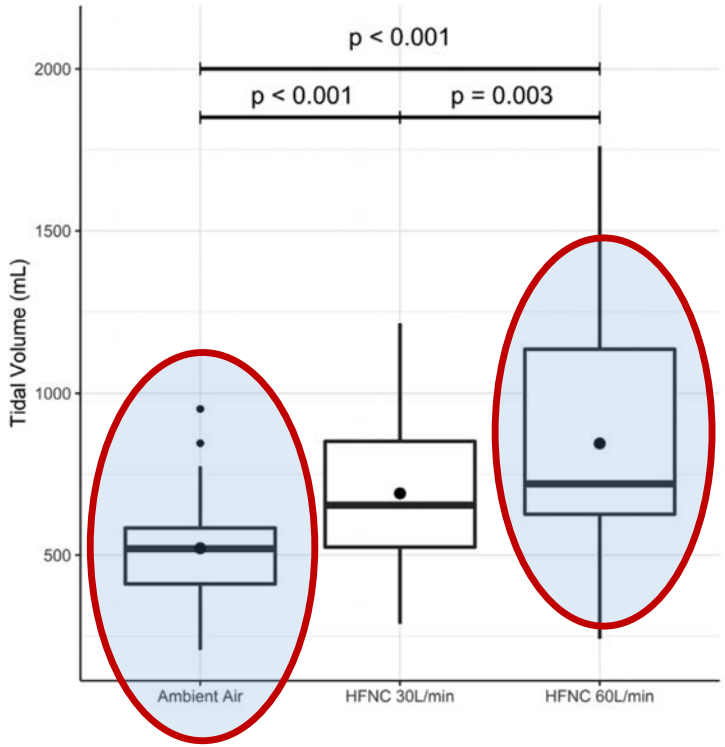
Perspectives: personnalisation des supports non invasifs ?

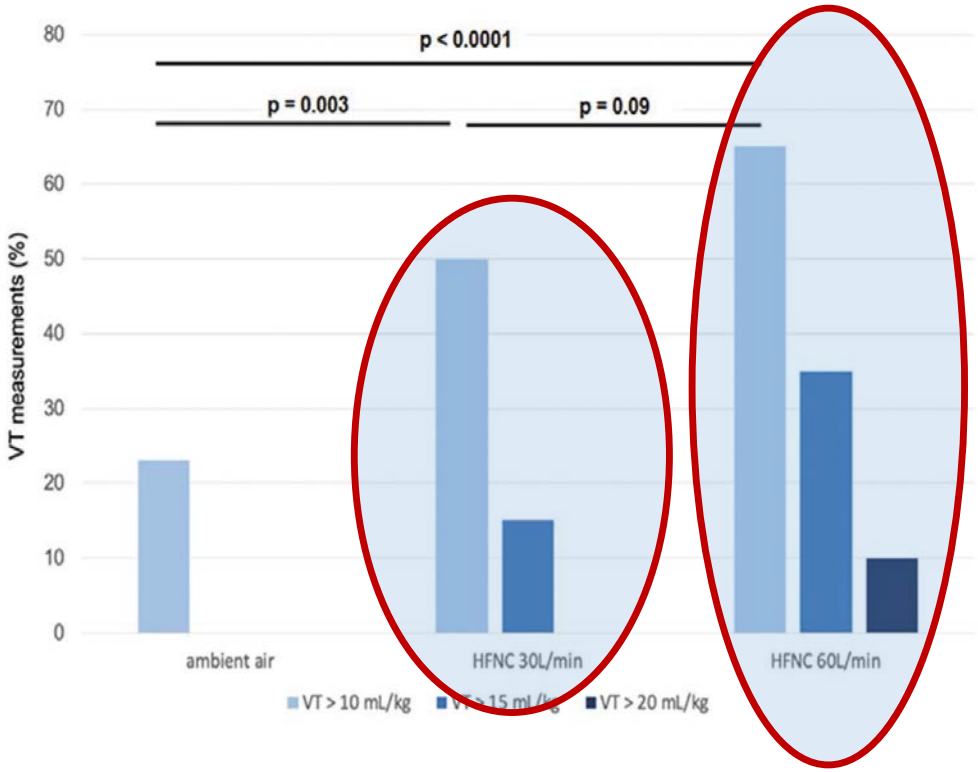
ONLINE LABORATORY INVESTIGATIONS

Noninvasive Tidal Volume Measurements, Using a Time-of-Flight Camera, Under High-Flow Nasal Cannula—A Physiological Evaluation, in Healthy Volunteers*

Le Moigne, Guillaume MD[1]; Nazir, Souha PhD[2]; Pateau, Victoire MsC[3]; Courtois, Emmanuelle MsC[4]; L'Her, Erwan MD, PhD[2,3]

Critical Care Medicine 50(1):p e61-e70, January 2022. | **DOI:** 10.1097/CCM.0000000000005183





Et le décubitus ventral ?

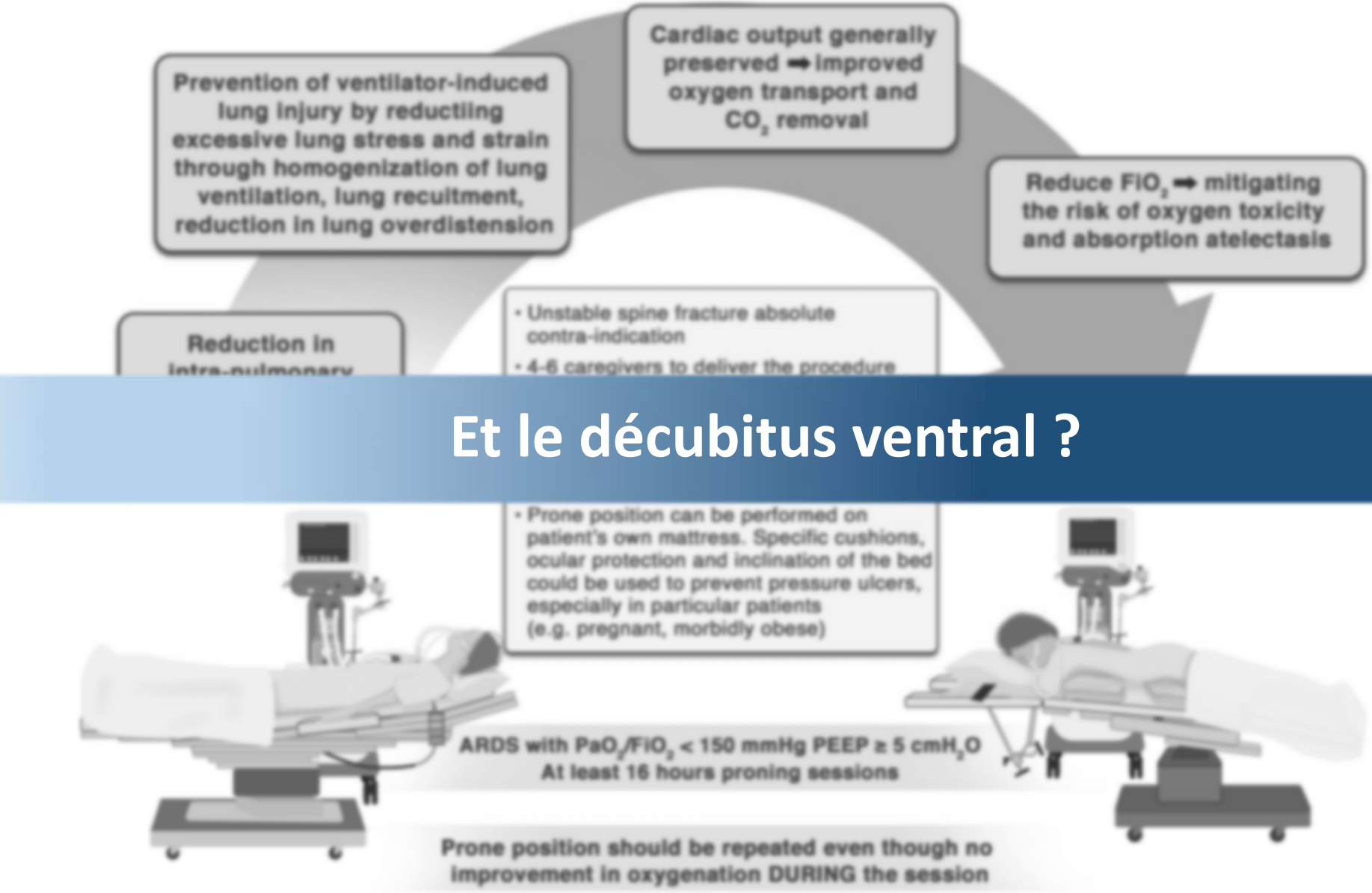


Fig. 1 Pathophysiological mechanisms, indications and practical tips

Pourquoi utiliser le DV ?

Améliorer l’oxygénation

Réduction du shunt intra-pulmonaire

Homogénéisation du stress et du strain

Réduction du Biotrauma

Effets hémodynamiques

Réduction du VILI

RESEARCH Open Access

Physiological effects of awake prone position in acute hypoxemic respiratory failure

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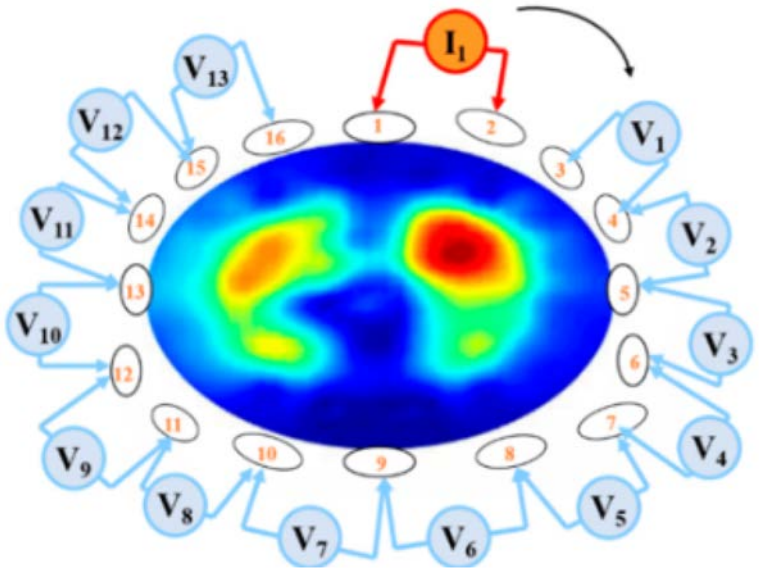
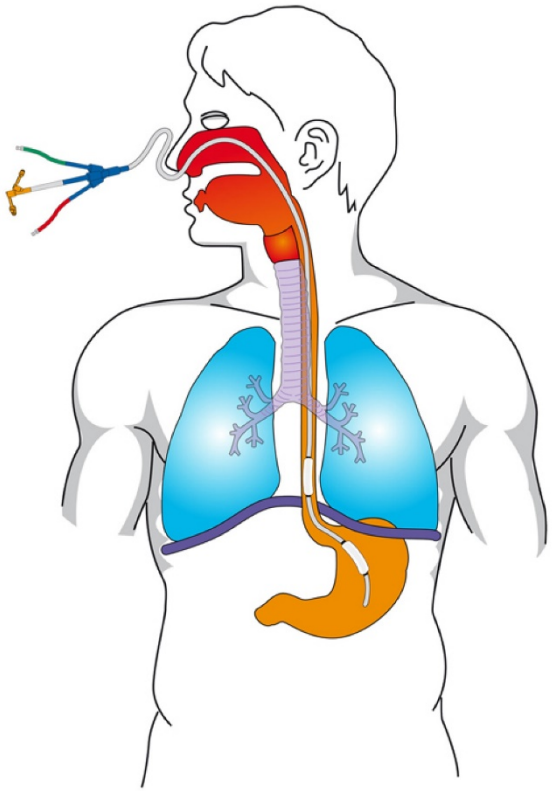


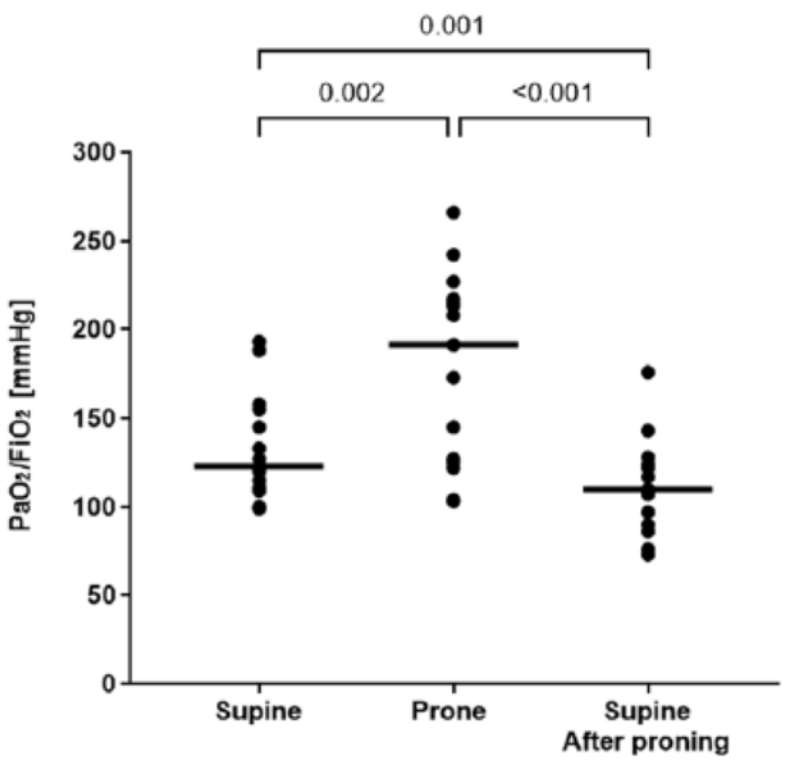
Electric impedance tomography



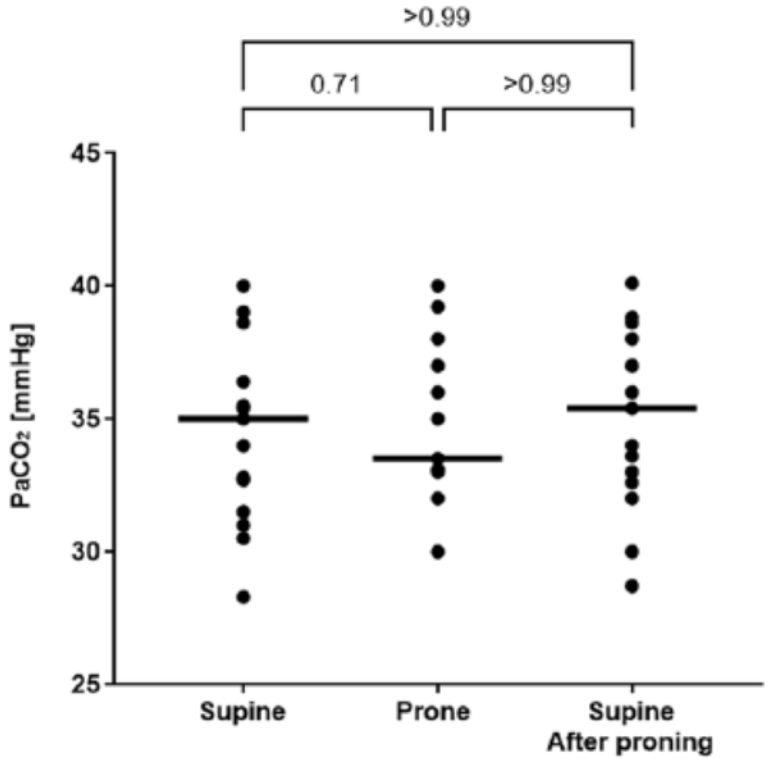
Esophageal pressure monitoring

Grieco D, Crit Care 2023

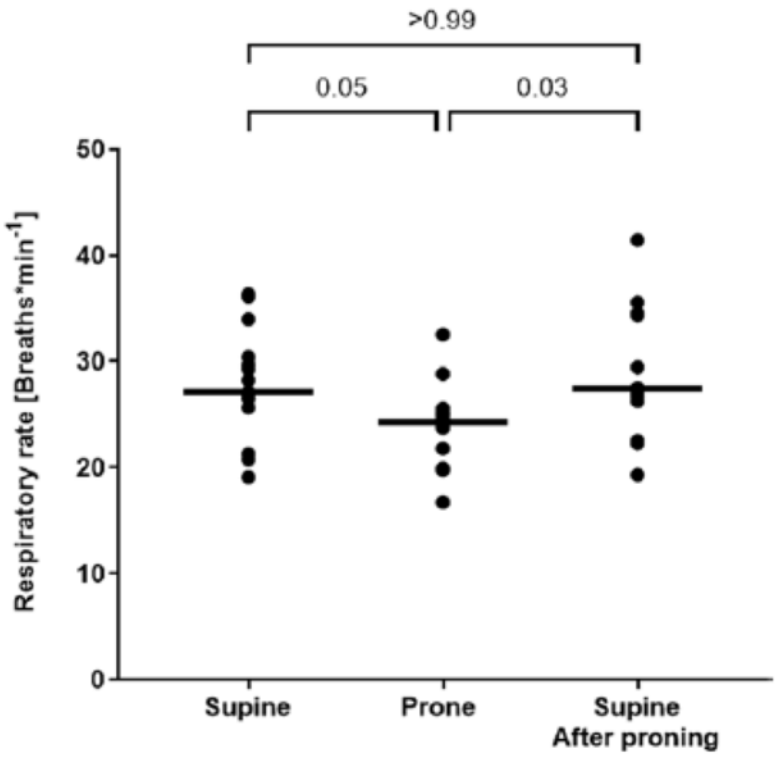
Oxygenation



$PaCO_2$



Respiratory Rate



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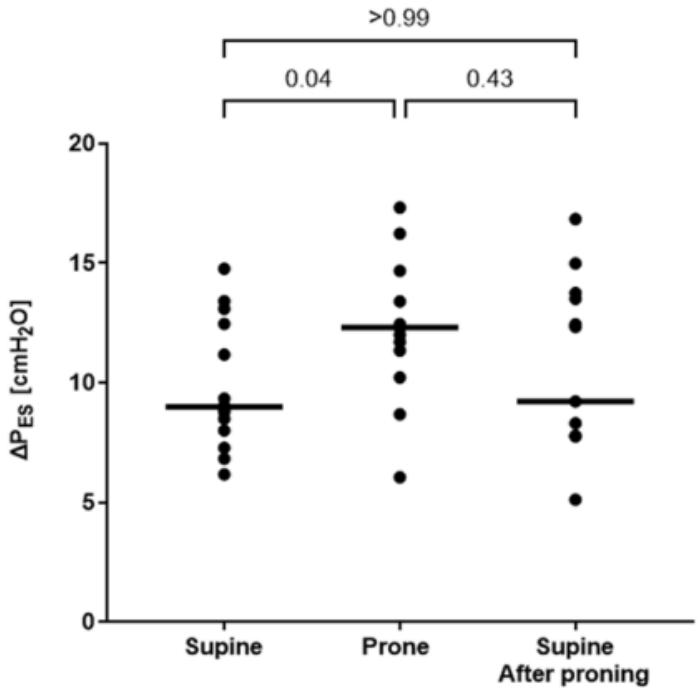
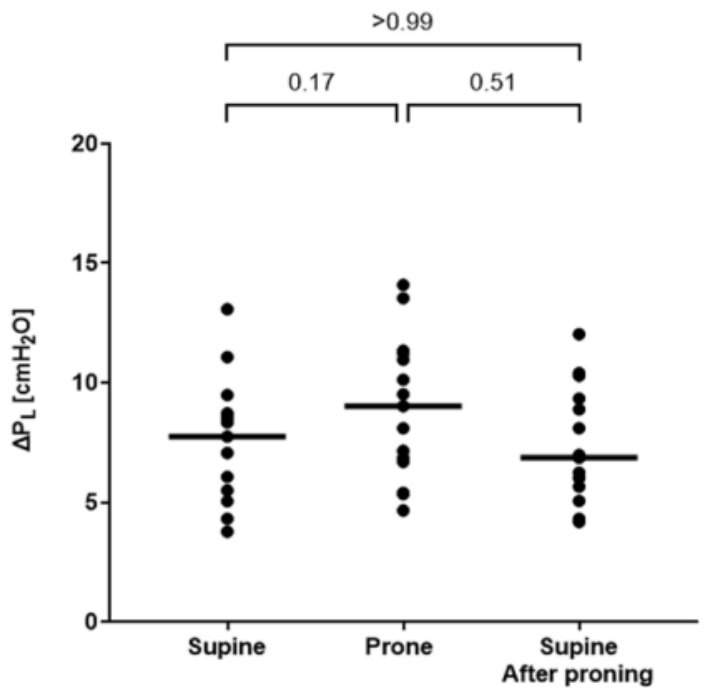
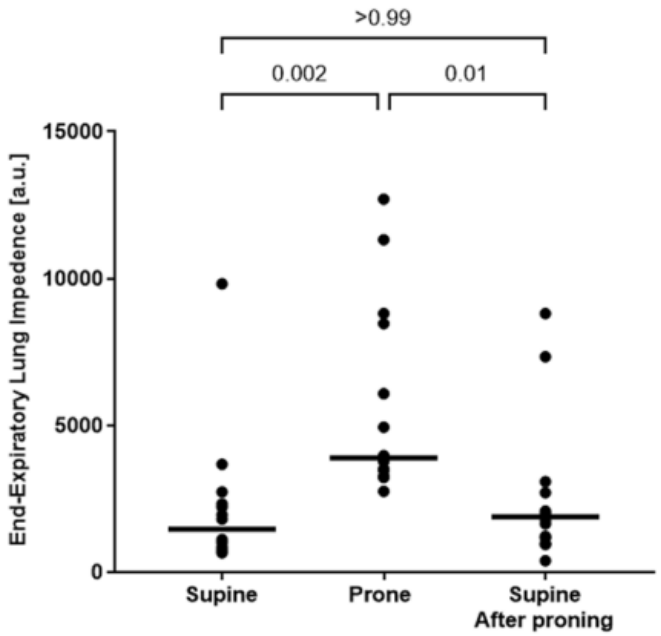
Inspiratory effort



Transpulmonary driving pressure



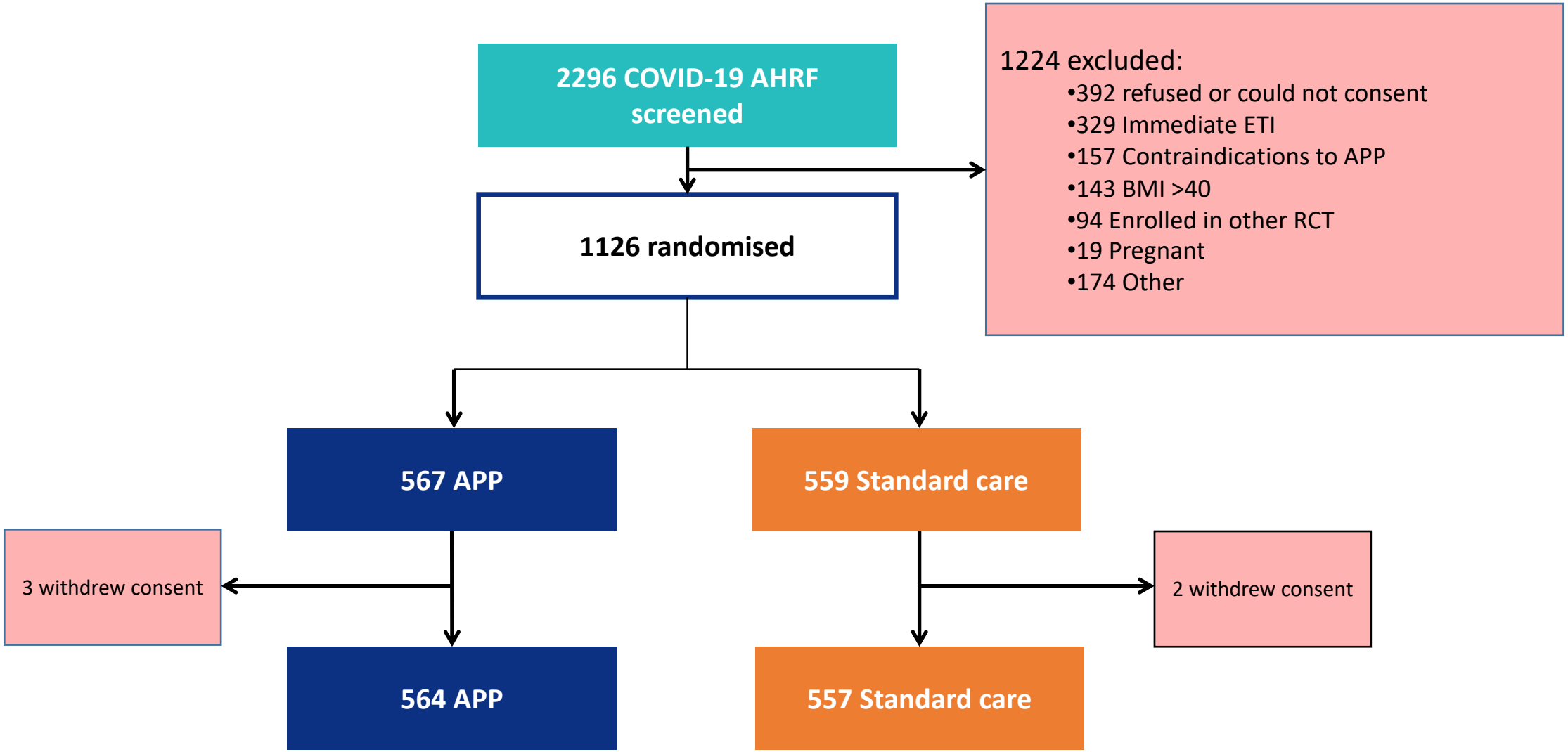
EELI



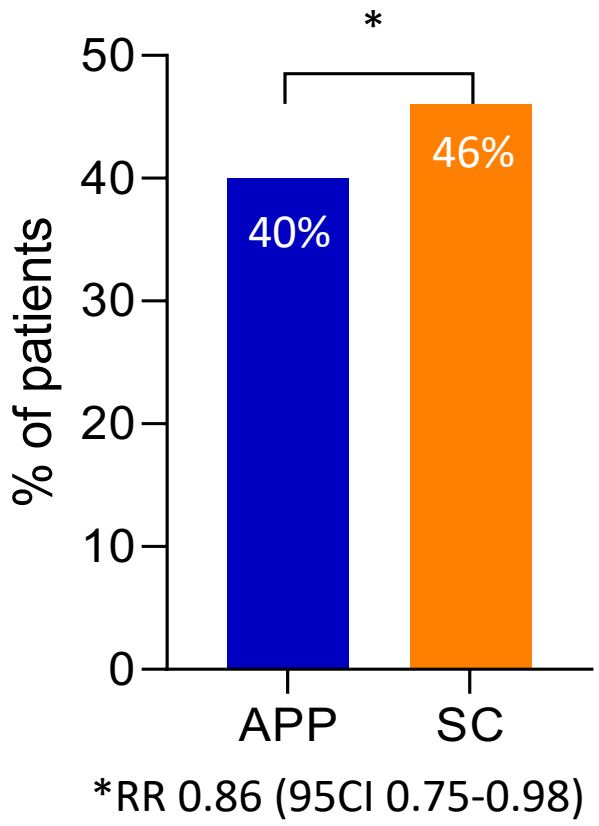
Grieco D, Crit Care 2023

Awake prone positioning for COVID-19 acute hypoxaemic respiratory failure: a randomised, controlled, multinational, open-label meta-trial

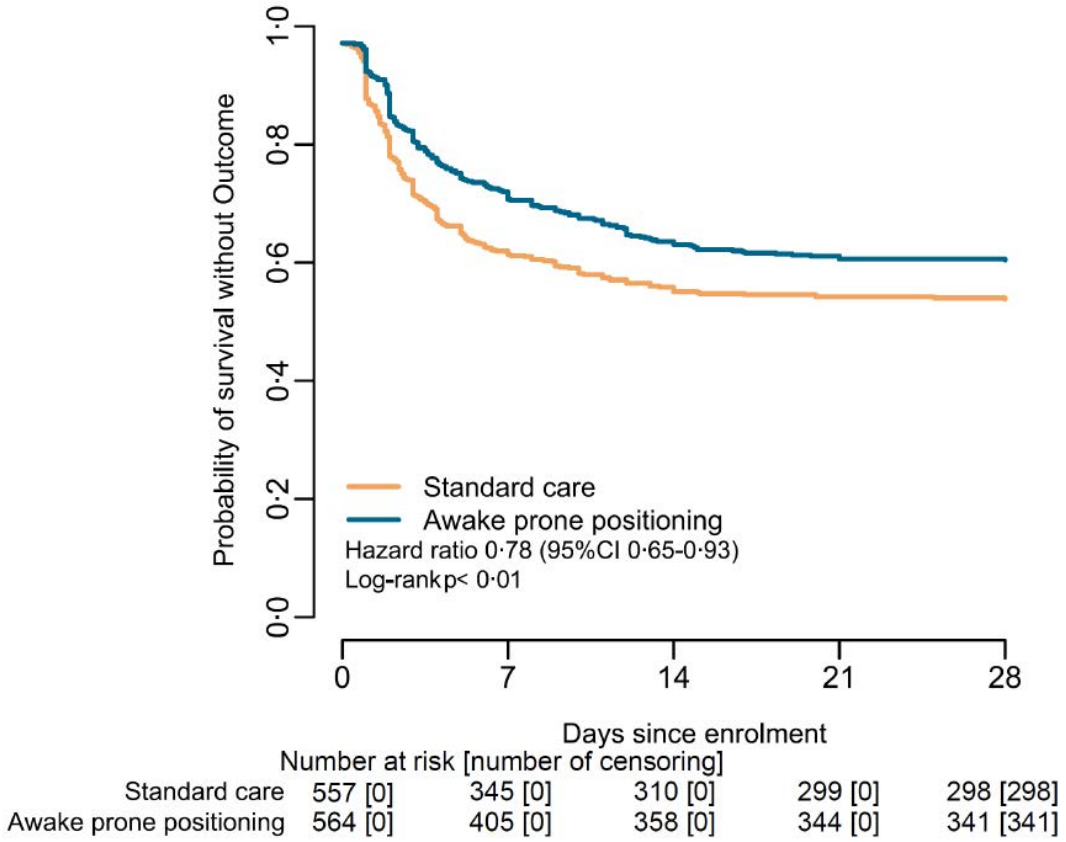
Stephan Ehrmann*, Jie Li*, Miguel Ibarra-Estrada*, Yonatan Perez*, Ivan Pavlov*, Bairbre McNicholas*, Oriol Roca*, Sara Mirza, David Vines, Roxana Garcia-Salcido, Guadalupe Aguirre-Avalos, Matthew W Trump, Mai-Anh Nay, Jean Dellamonica, Saad Nseir, Idrees Mogri, David Cosgrave, Dev Jayaraman, Joan R Masclans, John G Laffey, Elsa Tavernier, for the Awake Prone Positioning Meta-Trial Group†



Primary outcome : intubation or death at D28



*RR 0.86 (95CI 0.75-0.98)



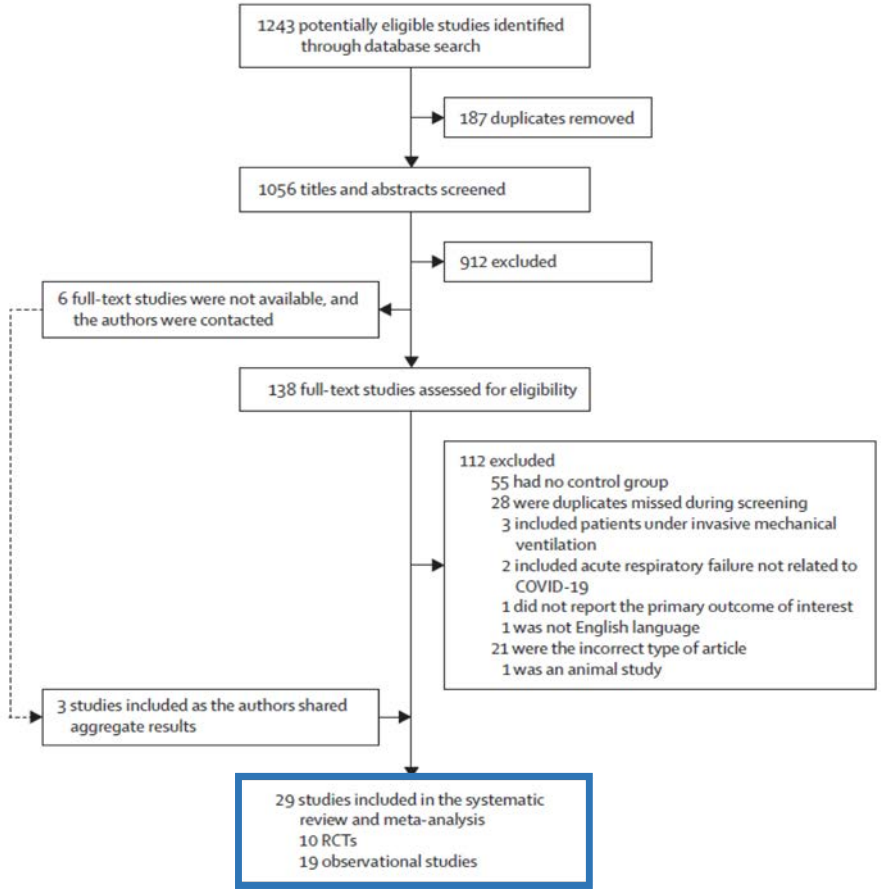
NNT to avoid 1 treatment failure = 15 (CI_{95} 8 – 156)

Ehrmann S, Lancet Respir Med 2021

Awake prone positioning for non-intubated patients with COVID-19-related acute hypoxaemic respiratory failure: a systematic review and meta-analysis

Jie Li, Jian Luo*, Ivan Pavlov*, Yonatan Perez*, Wei Tan*, Oriol Roca, Elsa Tavernier, Aileen Kharat, Bairbre McNicholas, Miguel Ibarra-Estrada, David L Vines, Nicholas A Bosch, Garrett Rampon, Steven Q Simpson, Allan J Walkey, Michael Fralick, Amol Verma, Fahad Razak, Tim Harris, John G Laffey†, Claude Guerin†, Stephan Ehrmann†, for the Awake Prone Positioning Meta-Analysis Group‡*

Lancet Respir Med 2022
Published Online
March 16, 2022



- 1 meta-trial
- 6 published RCT
- 3 un published RCT

N=1985 patients

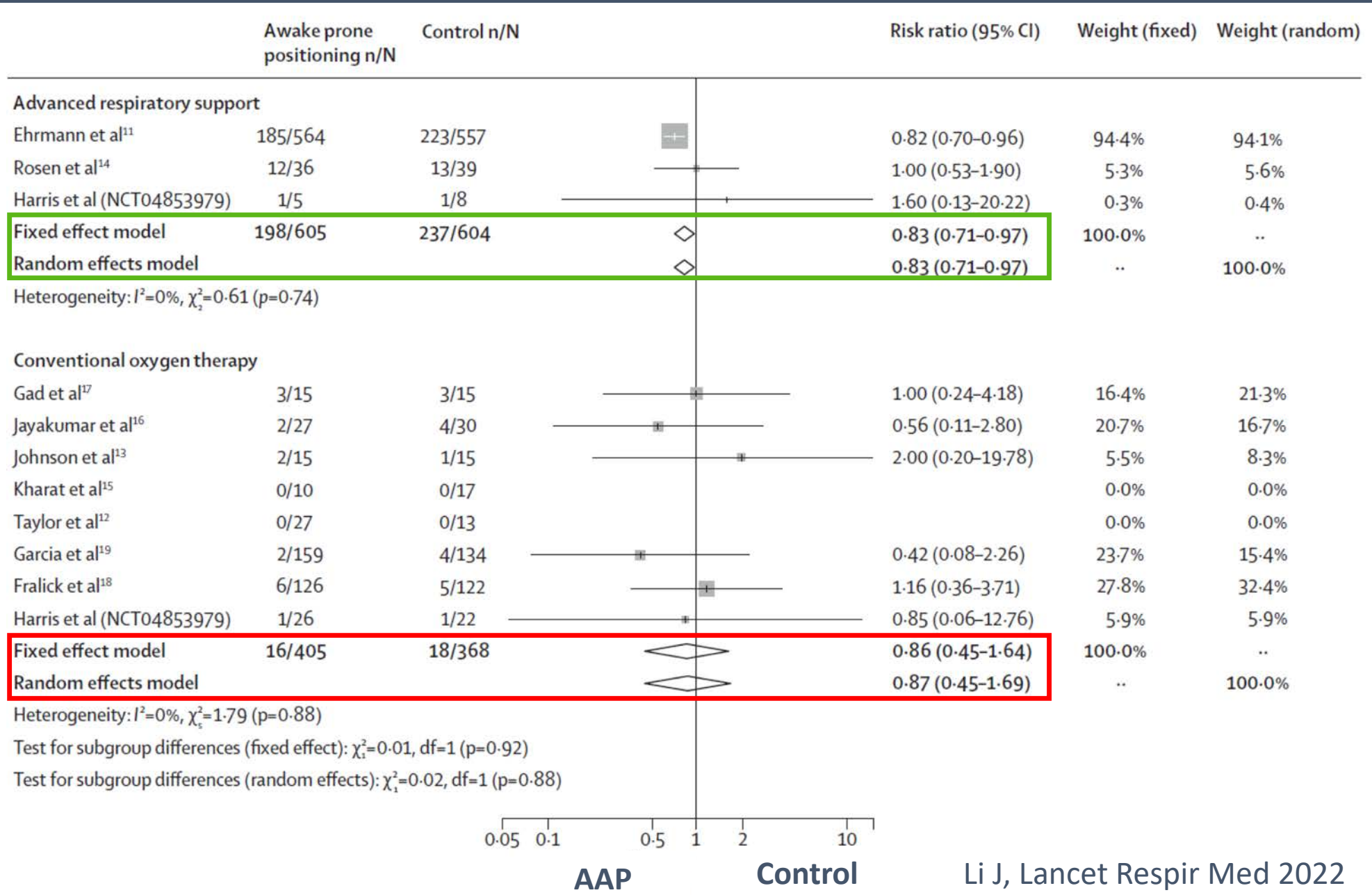
- 19 observational studies with control group

N=2669 patients

Intubation

High Flow
NIV
CPAP

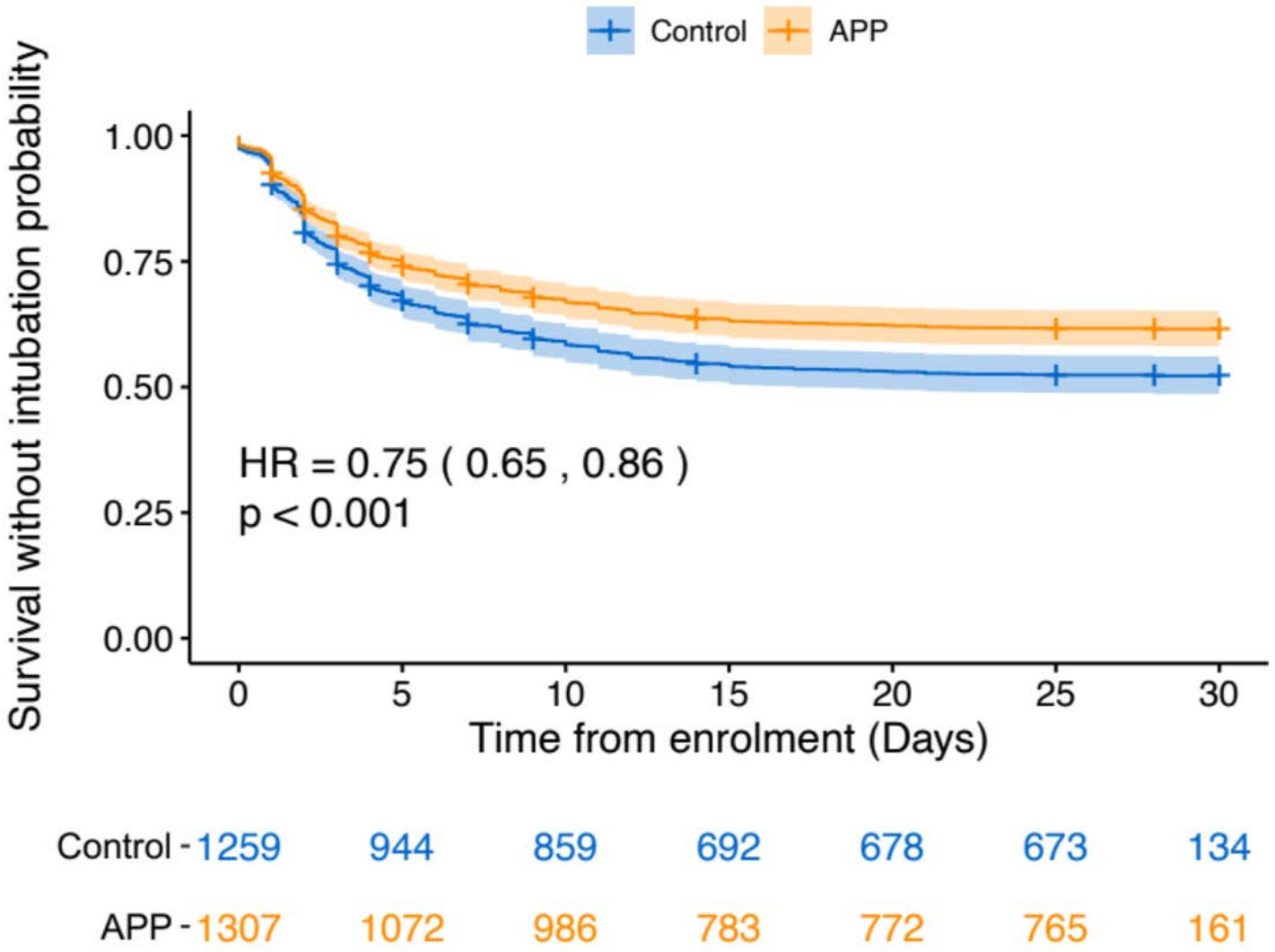
Standard oxygen



Li J, Lancet Respir Med 2022

Awake Prone Positioning in Adults With COVID-19: An Individual Participant Data Meta-Analysis

JAMA Intern Med
Published Online: March 10, 2025
2025;185;(5):572-581.
doi:10.1001/jamainternmed.2025.0011



3019 Patients

Prolonged APP duration:
10 or more hours/d was associated with better outcomes

Jian Luo et al.

Protocolisation de l'intubation ?

L'avis des experts

1 seul suffisant

Plusieurs nécessaires

Major criteria

- Cardiac or respiratory arrest
- Altered consciousness defined as a Glasgow coma scale < 9
- Persistent hypoxemia despite maximal oxygen delivery or maximal inspired fraction of oxygen (FiO_2) defined as PaO_2 < 60 mm Hg, PaO_2/FiO_2 < 60 mm Hg, or SpO_2 < 88%
- Respiratory acidosis defined as pH < 7.20

Thille Ann Intensive Care 2024

Où admettre ces patients ?

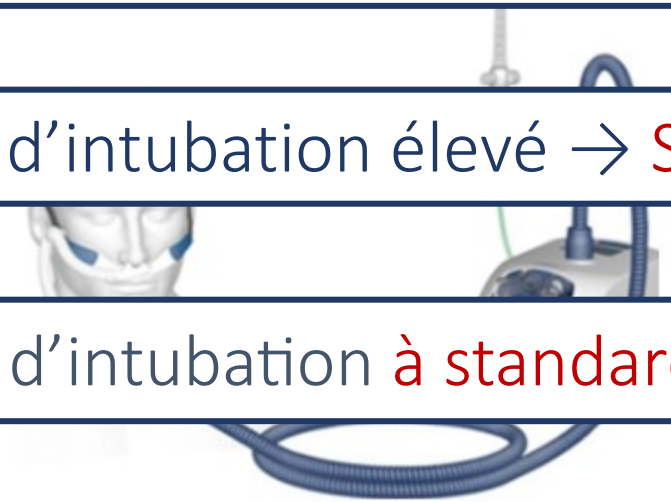
Outcome	Study Group		
	OHND (N = 106)	OXYGENE (N = 94)	NIV (N = 110)
Intubation at day 28			
% of patients (95% CI)	38 (29–47)	47 (37–57)	50 (41–59)

Utile pour décider du lieu d'admission

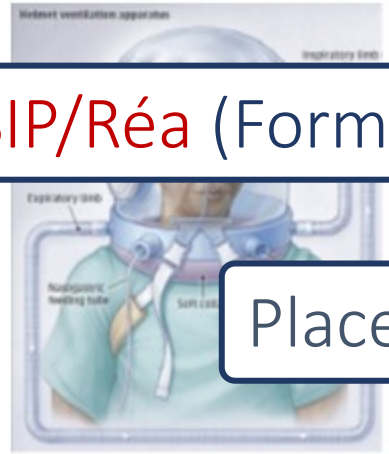
Frat New Engl J Med 2015

En conclusion

Méthodes d'oxygénation non invasives possibles



Risque d'intubation élevé → Surveillance USIP/Réa (Formation)



Critères d'intubation à standardiser ?

Place de la CPAP ?

Poursuite de la personnalisation sur des paramètres physiologiques

Décubitus ventral non-intubés : Intéressant dans la Covid-19 si prolongé
Autres indications ?