Oxygénothérapie et ventilation non invasive

D Mokart, MD, PhD

Département D'Anesthésie-Réanimation

Institut Paoli-Calmettes, Marseille, France

Rencontres E Markiewicz, 18ème édition, Urgences et Complications sévères chez le patient cancéreux

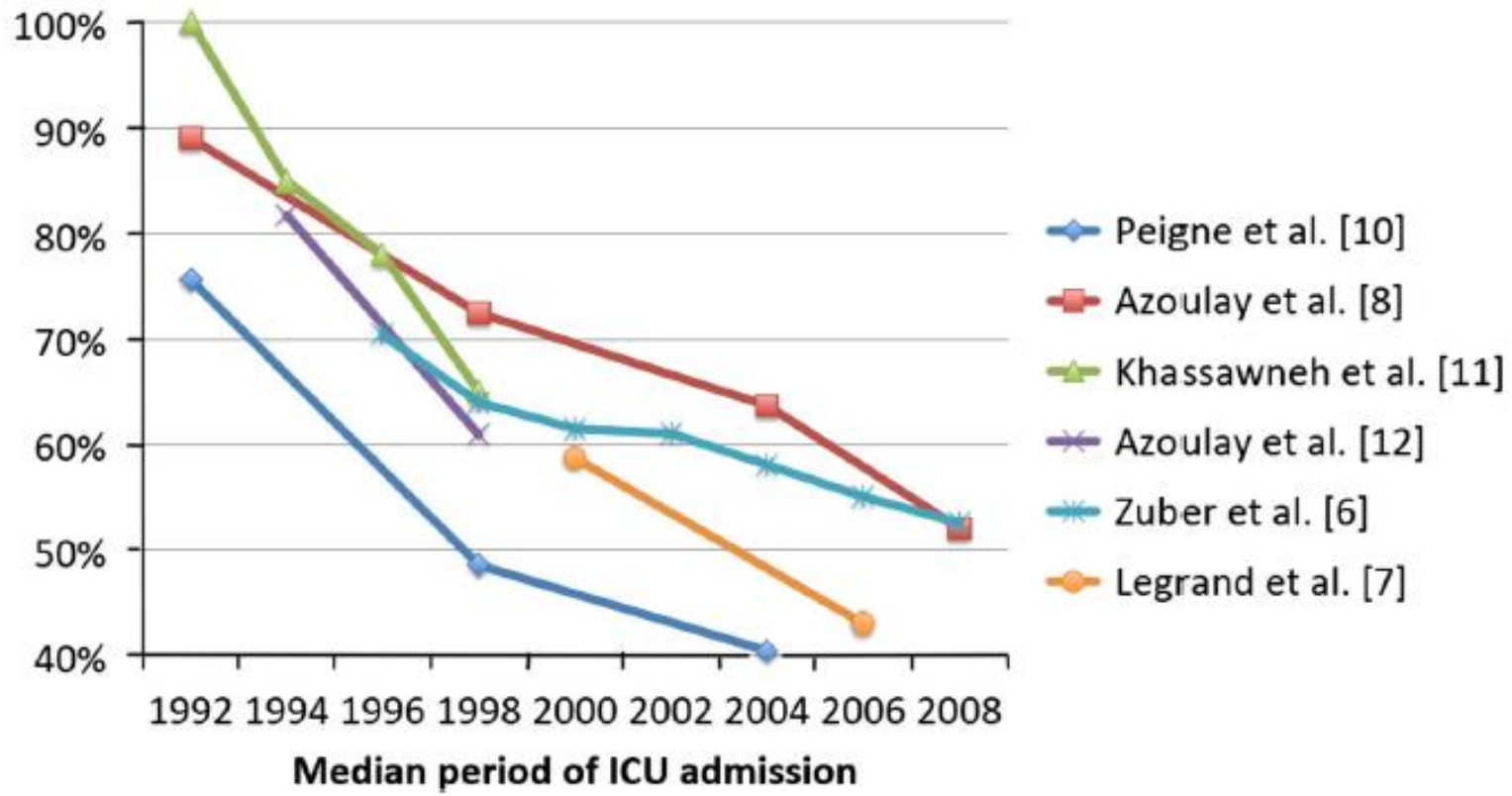
Samedi 21 octobre 2017, Institut Jules Bordet, Bruxelles

Intensive Care Med (2014) 40:1570–1572
DOI 10.1007/s00134-014-3433-2

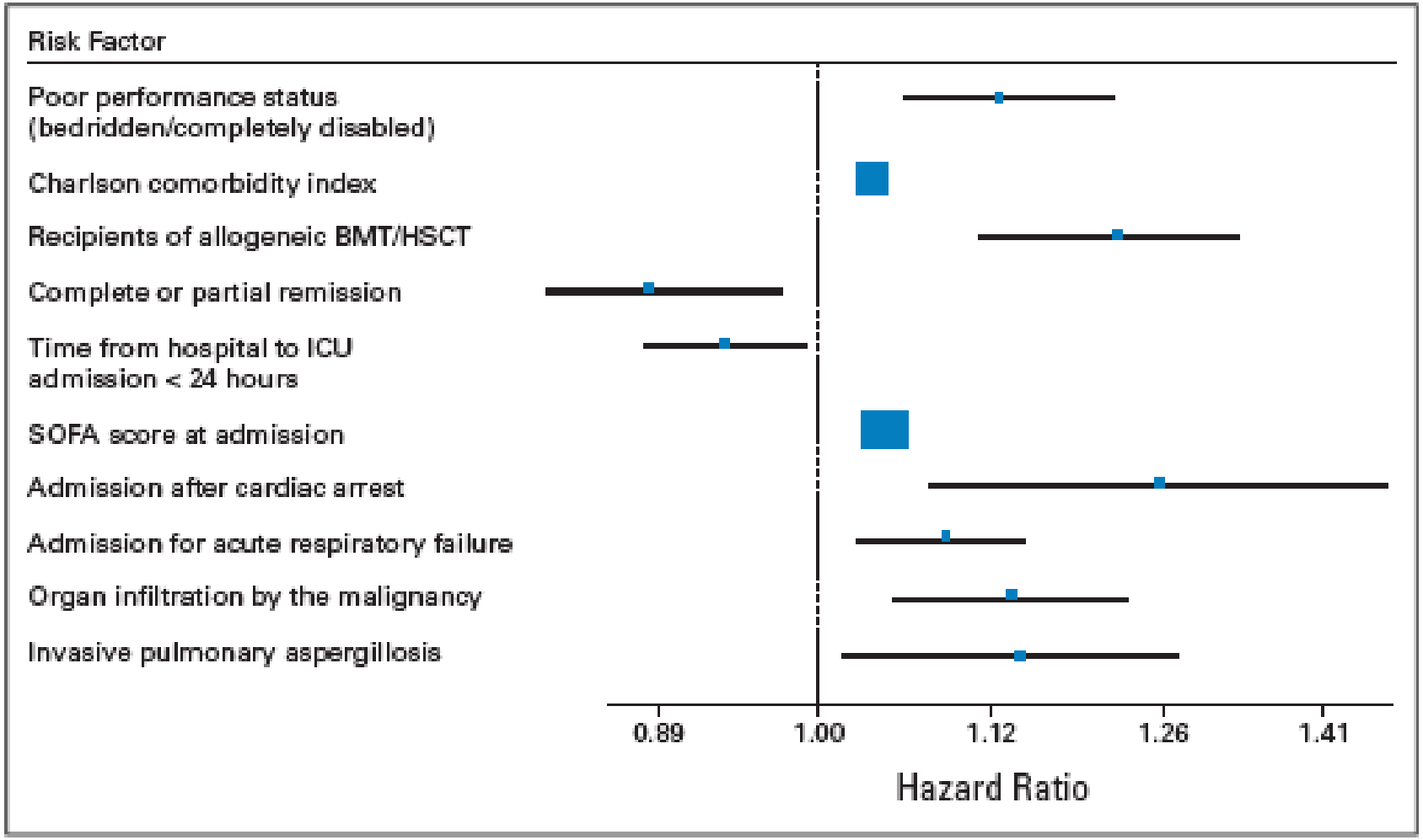
PRO EDITORIAL

Djamel Mokart
Stephen M. Pastores
Michael Darmon

Has survival increased in cancer patients admitted to the ICU? Yes



Amélioration du pronostic des patients d'onco-hématologie admis en réanimation



ICU mortality 27%
Hospital mortality 38%
1-year mortality 57%

Azoulay et al, J Clin Oncol. 2013 Aug 1;31(22):2810-8

Acute respiratory distress syndrome in patients with malignancies.

Azoulay E, Lemiale V, Mokart D, Pène F, Kouatchet A, Perez P, Vincent F, Mayaux J, Benoit D, Bruneel F, Meert AP, Nyunga M, Rabbat A, Darmon M.

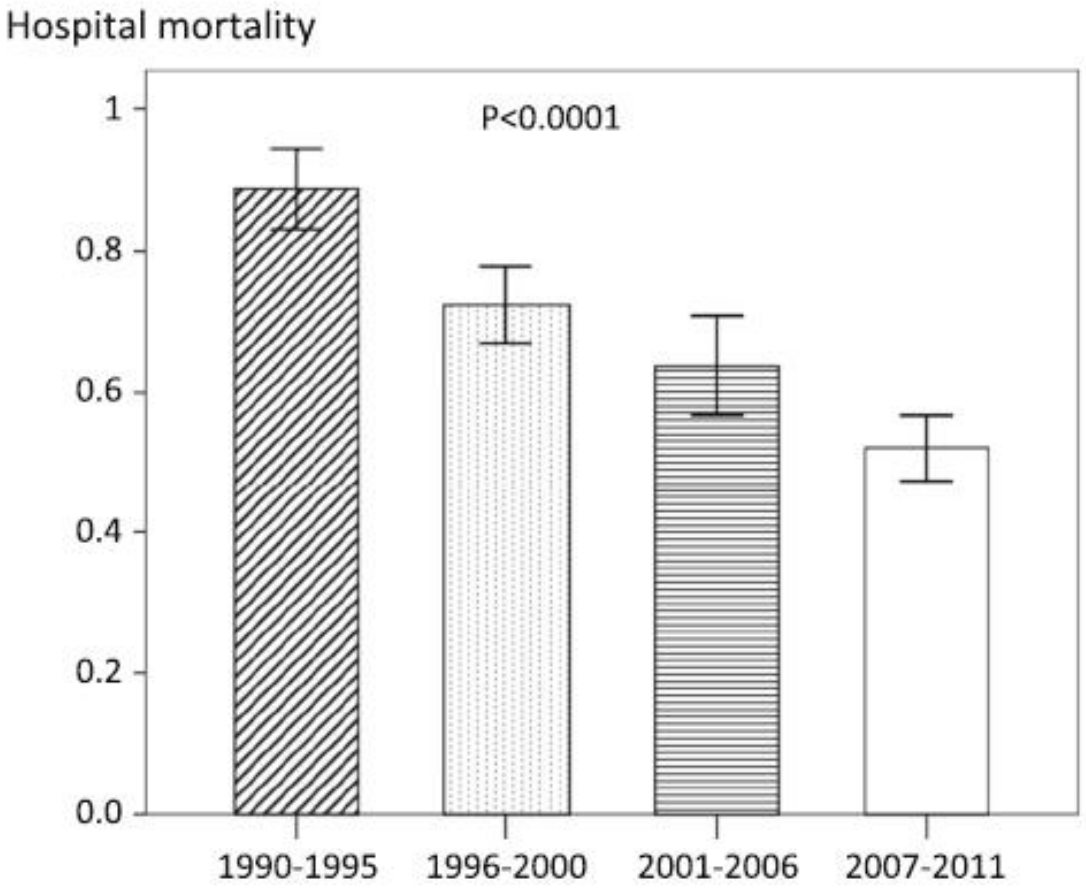
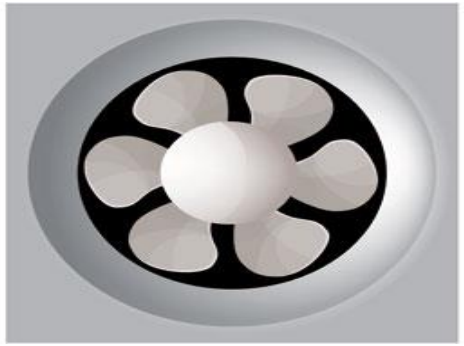


Table 3 Factors independently associated with hospital mortality

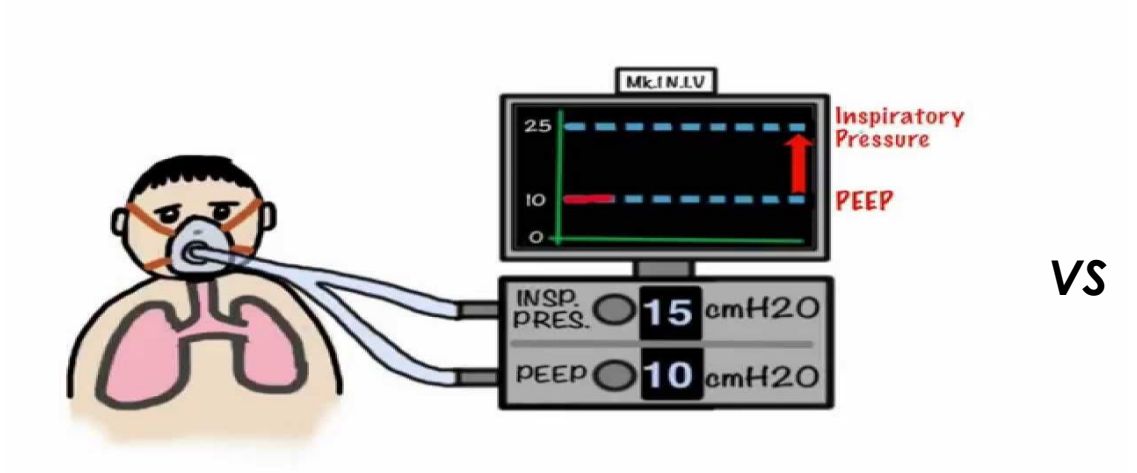
	OR	95 % CI	*p* value
Solid tumor	0.51	(0.34–0.77)	0.002
Need for emergency surgery	0.61	(0.35–1.05)	0.07
Allogeneic BMT/HSCT	1.71	(1.07–2.71)	0.04
mSOFA (per point)	1.11	(1.06–1.16)	<0.001
Cause of respiratory involvement			
No definite diagnosis	1	(Reference)	–
Primary ARDS	0.41	(0.20–0.88)	0.02
Secondary ARDS	0.90	(0.41–2.01)	0.80
Invasive fungal infection	1.72	(1.25–2.37)	0.001
Ventilation			
NIV	1	(Reference)	–
NIV failure	2.93	(1.80–4.79)	<0.001
Endotracheal MV	3.24	(2.02–5.24)	<0.001
ARDS severity			
Mild	1	(Reference)	–
Moderate	1.25	(0.88–1.78)	0.22
Severe	1.61	(1.10–2.36)	0.01

Intensive Care Med. 2014 Aug;40(8):1106-14.

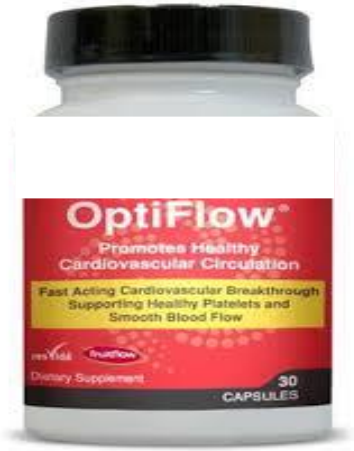
Quel support en Oxygène?



VS



VS



Official ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure

Bram Rochwerg[1], Laurent Brochard[2,3], Mark W. Elliott[4], Dean Hess[5], Nicholas S. Hill[6], Stefano Nava[7] and Paolo Navalesi[8] (members of the steering committee); Massimo Antonelli[9], Jan Brozek[1], Giorgio Conti[9], Miquel Ferrer[10], Kalpalatha Guntupalli[11], Samir Jaber[12], Sean Keenan[13,14], Jordi Mancebo[15], Sangeeta Mehta[16] and Suhail Raoof[17,18] (members of the task force)

TASK FORCE REPORT
ERS/ATS GUIDELINES

TABLE 2 Recommendations for actionable PICO questions

Clinical indication#	Certainty of evidence¶	Recommendation
Prevention of hypercapnia in COPD exacerbation	⊕⊕	Conditional recommendation against
Hypercapnia with COPD exacerbation	⊕⊕⊕⊕	Strong recommendation for
Cardiogenic pulmonary oedema	⊕⊕⊕	Strong recommendation for
Acute asthma exacerbation		No recommendation made
Immunocompromised	⊕⊕⊕	Conditional recommendation for
***De novo* respiratory failure**		No recommendation made
Post-operative patients	⊕⊕⊕	Conditional recommendation for
Palliative care	⊕⊕⊕	Conditional recommendation for
Trauma	⊕⊕⊕	Conditional recommendation for
Pandemic viral illness		No recommendation made
Post-extubation in high-risk patients (prophylaxis)	⊕⊕	Conditional recommendation for
Post-extubation respiratory failure	⊕⊕	Conditional recommendation against
Weaning in hypercapnic patients	⊕⊕⊕	Conditional recommendation for

#: all in the setting of acute respiratory failure; ¶: certainty of effect estimates: ⊕⊕⊕⊕, high; ⊕⊕⊕, moderate; ⊕⊕, low; ⊕, very low.

Eur Respir J 2017; 50: 1602426

Noninvasive Ventilation for Treatment of Acute Respiratory Failure in Patients Undergoing Solid Organ Transplantation

A Randomized Trial

Massimo Antonelli, MD

Giorgio Conti, MD

Maurizio Bufi, MD

Maria Gabriella Costa, MD

Angela Lappa, MD

Monica Rocco, MD

Alessandro Gasparetto, MD

Gianfranco Umberto Meduri, MD

Table 2. Outcome Variables*

Variable	Noninvasive Ventilation Group (n = 20)	Standard Treatment Group (n = 20)	*P* Value
Initial improvement in ratio of PaO_2 to fraction of inspired oxygen	14 (70)	5 (25)	.005
Sustained improvement in ratio of PaO_2 to fraction of inspired oxygen, without intubation	12 (60)	5 (25)	.03
Patients intubated within 24 h of study entry	3 (15)	10 (50)	.02
Patients requiring intubation	4 (20)	14 (70)	.002
Failures per subgroup of patients			
Acute respiratory distress syndrome (pulmonary etiology)†	2/5 (40)	2/2 (100)	.28
Acute respiratory distress syndrome (extrapulmonary etiology)†	1/3 (33)	4/5 (80)	.28
Pneumonia†	1/2 (50)	1/2 (50)	.83
Cardiogenic pulmonary edema†	0/4 (0)	5/5 (100)	.007
Pulmonary embolism	0/1 (0)	0/1 (0)	.99
Mucous plugging or atelectasis†	0/5 (0)	2/5 (40)	.22
Duration of mechanical ventilation, d‡§	4 (5)	5 (6)	.58
Duration of mechanical ventilation in survivors, d‡	2 (0.7)	1.6 (2)	.50
Duration of use for all invasive devices present at study entry, d‡	5 (5)	9 (6)	.05
Length of intensive care unit stay, d‡	7 (5)	10 (6)	.18
Length of intensive care unit stay in survivors, d‡	5.5 (3)	9 (4)	.03
Intensive care unit deaths‖	4 (20)	10 (50)	.05

JAMA. 2000 Jan 12;283(2):235-41.

NONINVASIVE VENTILATION IN IMMUNOSUPPRESSED PATIENTS WITH PULMONARY INFILTRATES, FEVER, AND ACUTE RESPIRATORY FAILURE

GILLES HILBERT, M.D., DIDIER GRUSON, M.D., FRÉDERIC VARGAS, M.D., RUDDY VALENTINO, M.D., GEORGES GBIKPI-BENISSAN, M.D., MICHEL DUPON, M.D., JOSY REIFFERS, M.D., AND JEAN P. CARDINAUD, M.D.

TABLE 2. OUTCOMES OF TREATMENT.*

OUTCOME	NONINVASIVE-VENTILATION GROUP (N=26)	STANDARD-TREATMENT GROUP (N=26)	P VALUE	RELATIVE RISK (95% CI)
Intubation — no./total no. (%)	12/26 (46)	20/26 (77)	0.03	0.60 (0.38–0.96)
Immunosuppression from hematologic cancer and neutropenia	8/15 (53)	14/15 (93)	0.02	0.57 (0.35–0.93)
Drug-induced immunosuppression	3/9 (33)	5/9 (56)	0.32	0.60 (0.20–1.79)
Immunosuppression from the acquired immunodeficiency syndrome	1/2 (50)	1/2 (50)	0.83	1.00 (0.14–7.10)
Initial improvement in PaO_2:FiO_2 — no. (%)	12 (46)	4 (15)	0.02	
Sustained improvement in PaO_2:FiO_2 without intubation — no. (%)	13 (50)	5 (19)	0.02	
Death in the ICU — no./total no. (%)†	10/26 (38)	18/26 (69)	0.03	0.56 (0.32–0.96)
Immunosuppression from hematologic cancer and neutropenia	7/15 (47)	13/15 (87)	0.02	0.54 (0.30–0.96)
Drug-induced immunosuppression	3/9 (33)	4/9 (44)	0.50	0.75 (0.23–2.44)
Immunosuppression from the acquired immunodeficiency syndrome	0/2	1/2 (50)	0.50	0.50 (0.13–2.00)
Total duration of any ventilatory assistance — days				
Among all patients	6±3	6±5	0.59	
Among survivors	5±2	3±5	0.12	
Length of ICU stay — days				
Among all patients	7±3	9±4	0.11	
Among survivors	7±3	10±4	0.06	
Death in the hospital — no./total no. (%)	13/26 (50)	21/26 (81)	0.02	0.62 (0.40–0.95)
Immunosuppression from hematologic cancer and neutropenia	8/15 (53)	14/15 (93)	0.02	0.57 (0.35–0.93)
Drug-induced immunosuppression	4/9 (44)	6/9 (67)	0.32	0.67 (0.28–1.58)
Immunosuppression from the acquired immunodeficiency syndrome	1/2 (50)	1/2 (50)	0.83	1.00 (0.14–7.10)

Improved survival in cancer patients requiring mechanical ventilatory support: Impact of noninvasive mechanical ventilatory support

Elie Azoulay, MD; Corinne Alberti, MD; Caroline Bornstain, MD; Ghislaine Leleu, MD; Delphine Moreau, MD; Christian Recher, MD; Sylvie Chevret, MD, PhD; Jean-Roger Le Gall, MD; Laurent Brochard, MD, PhD; Benoît Schlemmer, MD

Après matching 48 NIV vs 48 VM

237 patients MV
- Deux périodes
  - 1990-1995
  - 1996-1998
- 189 MV première ligne
- 48 NIV première ligne
- Mortalité J30 = 72.5%

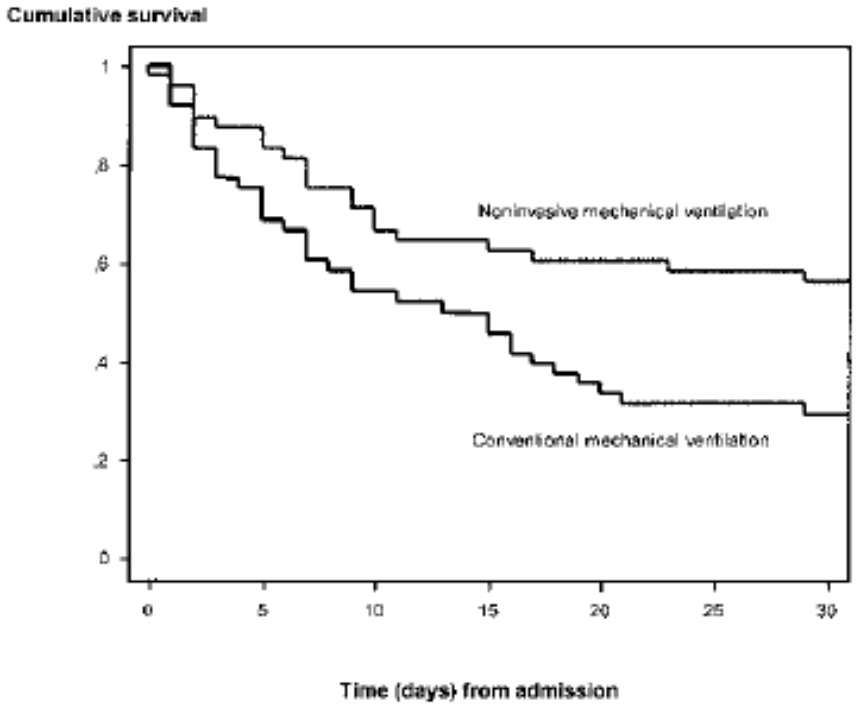


Table 3. Multivariable analysis: Additive predictors of 30-day mortality

Variables	Odds ratio	95% CI	*p* Value
Noninvasive mechanical ventilation	0.343	0.16–0.73	<.0001
ICU admission between 1996 and 1998	0.24	0.12–0.50	<.0001
SAPS II score (per point)	1.04	1.02–1.06	<.0001

Crit Care Med 2001 Vol. 29, No. 3

Outcome in Noninvasively and Invasively Ventilated Hematologic Patients With Acute Respiratory Failure*

Pieter O. Depuydt, MD; Dominique D. Benoit, MD; Koenraad H. Vandewoude, MD; Johan M. Decruyenaere, MD, PhD; and Francis A. Colardyn, MD

166 patients d'hématologie: DRA et VM

Table 3—*Results From Stepwise Logistic Regression Procedure

Variable	Parameter Estimate	OR	95% CI	p Value
Female sex	−1.01	0.36	0.16–0.82	0.014
Intubation < 24 h	−1.25	0.29	0.11–0.78	0.015
Bacteremia < 48 h	−1.52	0.22	0.08–0.61	0.003
AML	1.004	2.73	1.05–7.11	0.04
SAPS II	0.08	1.07	1.04–1.11	< 0.001

Table 4—*Characteristics of Matched Patients With and Without Exposure to NPPV

Characteristics	NPPV (n = 26)	Invasive MV (n = 52)	p Value
Age, yr	44.5 (35–63)	57.5 (41–69)	0.06
Female gender	8 (30.8)	19 (36.5)	0.80
Underlying malignancy			
AML	9 (34.6)	13 (25.0)	0.13
ALL	7 (26.9)	4 (7.7)	
High-grade NHL	2 (7.7)	11 (21.2)	
Low-grade NHL	2 (7.7)	6 (11.5)	
MM	3 (11.5)	12 (23.1)	
Other	3 (11.5)	6 (11.5)	
Active disease	7 (26.9)	12 (23.1)	0.78
Allogeneic BMT	5 (19.2)	8 (15.4)	0.75
Leukopenia on ICU admission	6 (23.1)	9 (17.3)	0.55
GCS	14.5 (13–15)	15 (15–15)	0.002
SAPS II	46	46	
Pao_2/Fio_2	72 (56–86)	147 (78–201)	< 0.001
PEEP level	5 (5–8)	5 (5–10)	0.17
Vasopressor need	7 (26.9)	25 (48.1)	0.09
Bacteremia < 48 h	5 (20.0)	5 (9.6)	0.2
RRT	4 (15.4)	18 (34.6)	0.08
Leukopenia during ICU stay	8 (30.8)	17 (32.7)	0.99
DNR decision	11 (42.3)	16 (31.4)	0.34
In-hospital mortality	17 (65.4)	34 (65.4)	0.99

CHEST / 126 / 4 / OCTOBER, 2004

Noninvasive versus invasive ventilation for acute respiratory failure in patients with hematologic malignancies: A 5-year multicenter observational survey*

Gristina GR, Antonelli M, Conti G, Ciarlone A, Rogante S, Rossi C, Bertolini G; GiViTI (Italian Group for the Evaluation of Interventions in Intensive Care Medicine).

- 1,302 patients (2000-2006), 158 réanimations
- 21% traités initialement par VNI; 46% d échec
- Outcomes
  - Survie "succés NIV"> VM immédiate > échec VNI (p=0,12)
  - Mortalité ALI/ARDS: 42% > 69% > 77%
  - Mortalité IOT immédiate vs IOT tardive: 58% vs 65% (p=0,12)
- Après ajustement sur la propension à utiliser la VNI à J0
  - Mortalité "VNI immédiate "< "Mortalité intubation immédiate"

Crit Care Med 2011 Vol. 39, No. 10

Noninvasive versus invasive ventilation for acute respiratory failure in patients with hematologic malignancies: A 5-year multicenter observational survey*

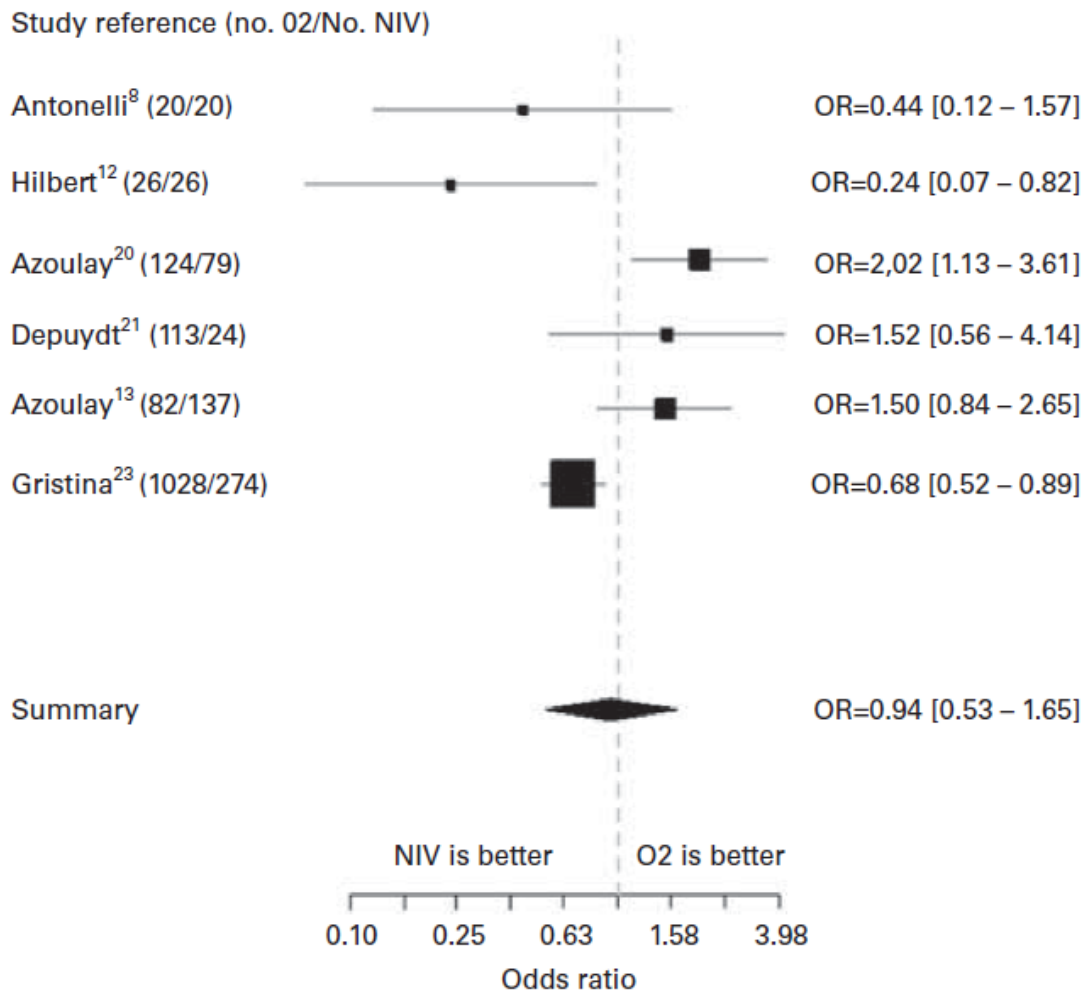
Gristina GR, Antonelli M, Conti G, Ciarlone A, Rogante S, Rossi C, Bertolini G; GiViTI (Italian Group for the Evaluation of Interventions in Intensive Care Medicine).

Table 2. Risk factors for mortality

Factor	Odds Ratio[a] Point Estimate (95% Confidence Limits)
Initial ventilatory support: Noninvasive Mechanical Ventilation vs. Invasive Mechanical Ventilation	0.73 (0.53–1.00)
Hematologic Malignancy: Admission Diagnosis vs. Comorbidity	1.34 (1.03–1.73)
Admission from Another Intensive Care Unit vs. Medical Ward	0.98 (0.60–1.60)
Admission from Emergency Department vs. Medical Ward	0.66 (0.49–0.88)
Admission from Surgical Ward vs. Medical Ward	0.62 (0.42–0.92)
Acute Lung Injury	1.69 (1.16–2.47)
Adult Respiratory Distress Syndrome	2.09 (1.32–3.31)
Stroke	2.29 (1.11–4.75)
Septic Shock	2.43 (1.61–3.65)
Other Type of Shock	2.16 (1.24–3.76)
Coagulopathy	1.59 (1.13–2.23)
Coma	1.68 (1.05–2.69)
Age	1.01 (1.01–1.02)
Simplified Acute Physiology Score II (each 4-point increase)	4.66 (2.98–7.28)
Propensity score	5.07 (1.40–18.32)

Crit Care Med 2011 Vol. 39, No. 10

Non-invasive mechanical ventilation in hematology patients with hypoxemic acute respiratory failure: a false belief?



Bone Marrow Transplantation (2012) 47, 469–472

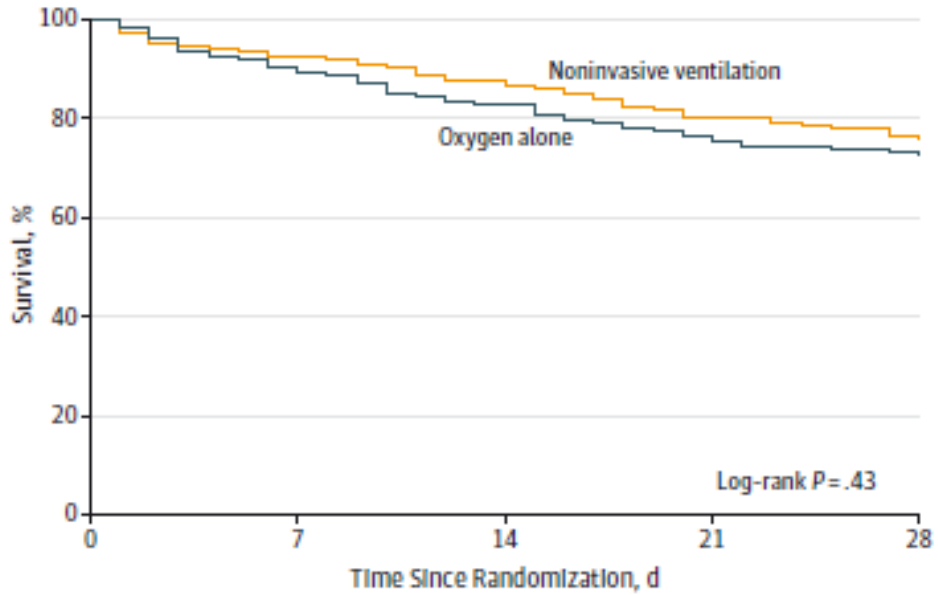
Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Noninvasive Ventilation vs Oxygen Therapy on Mortality Among Immunocompromised Patients With Acute Respiratory Failure

A Randomized Clinical Trial

Virginie Lemiale, MD; Djamel Mokart, MD; Matthieu Resche-Rigon, MD, PhD; Frédéric Pène, MD, PhD; Julien Mayaux, MD; Etienne Faucher, MD; Martine Nyunga, MD; Christophe Girault, MD, PhD; Pierre Perez, MD; Christophe Guitton, MD, PhD; Kenneth Ekpe, MD; Achille Kouatchet, MD; Igor Théodose, MS; Dominique Benoit, MD, PhD; Emmanuel Canet, MD; François Barbier, MD, PhD; Antoine Rabbat, MD; Fabrice Bruneel, MD; Francois Vincent, MD; Kada Klouche, MD, PhD; Kontar Loay, MD; Eric Mariotte, MD; Lila Bouadma, MD, PhD; Anne-Sophie Moreau, MD; Amélie Seguin, MD; Anne-Pascale Meert, MD, PhD; Jean Reignier, MD, PhD; Laurent Papazian, MD, PhD; Ilham Mehzari, MD; Yves Cohen, MD, PhD; Maleka Schenck, MD; Rebecca Hamidfar, MD; Michael Darmon, MD, PhD; Alexandre Demoule, MD, PhD; Sylvie Chevret, MD, PhD; Elie Azoulay, MD, PhD; for the Groupe de Recherche en Réanimation Respiratoire du patient d'Onco-Hématologie (GRRR-OH)

Figure 2. Probability of Survival at Day 28



No. at risk					
Noninvasive ventilation	191	177	167	153	146
Oxygen alone	183	165	152	140	134

Probability of survival and subgroup analyses of the risk of day-28 mortality Kaplan-Meier estimates of the probability of day-28 mortality in immunocompromised patients with acute respiratory failure receiving either early noninvasive ventilation or oxygen only. Statistical test used the log-rank test.

JAMA 2015 Oct 27;314(16):1711-9.

Oxygène haut débit

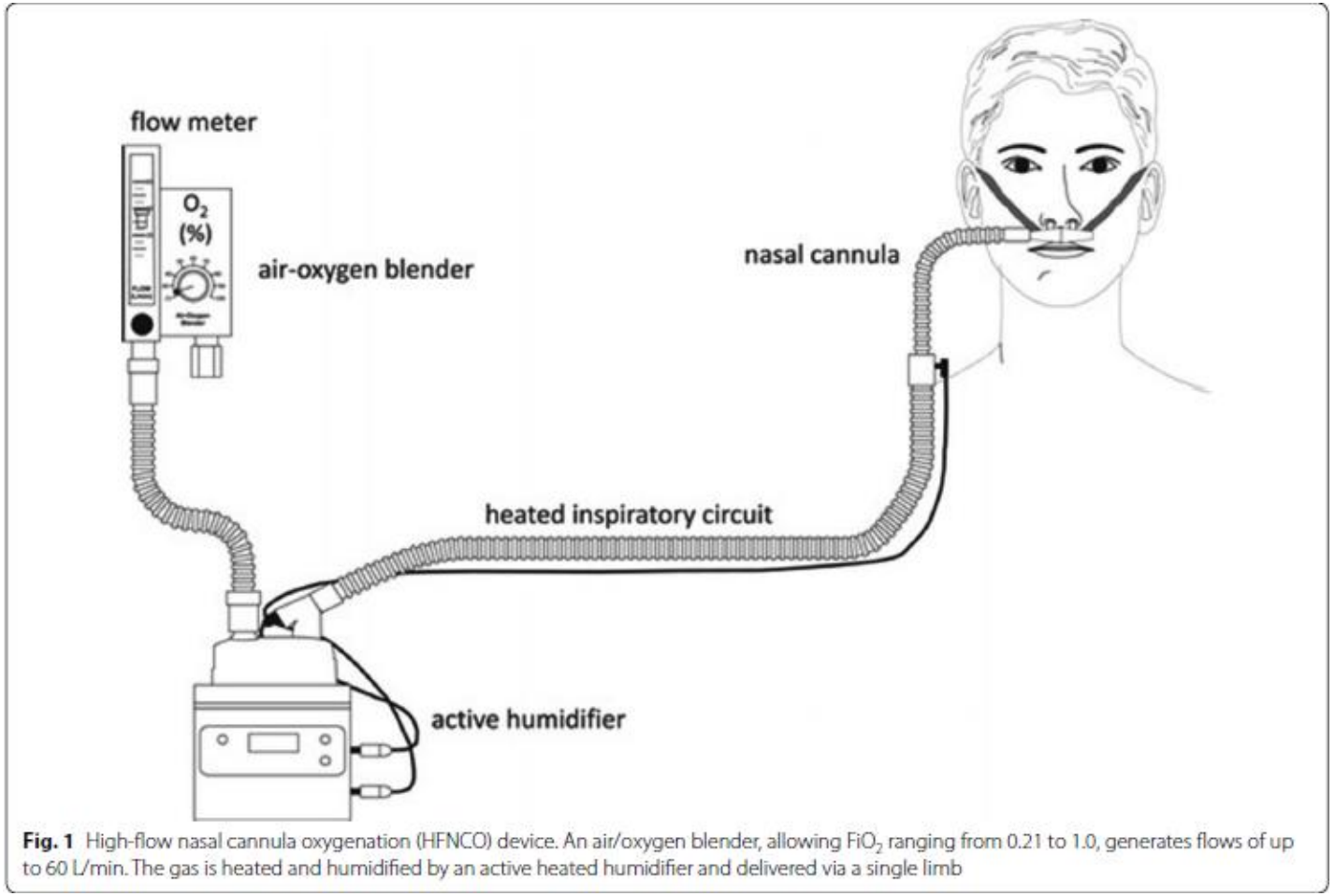


Fig. 1 High-flow nasal cannula oxygenation (HFNCO) device. An air/oxygen blender, allowing FiO_2 ranging from 0.21 to 1.0, generates flows of up to 60 L/min. The gas is heated and humidified by an active heated humidifier and delivered via a single limb

Intensive Care Med. **2016 Sep;42(9):1336-49**

Effets physiologiques

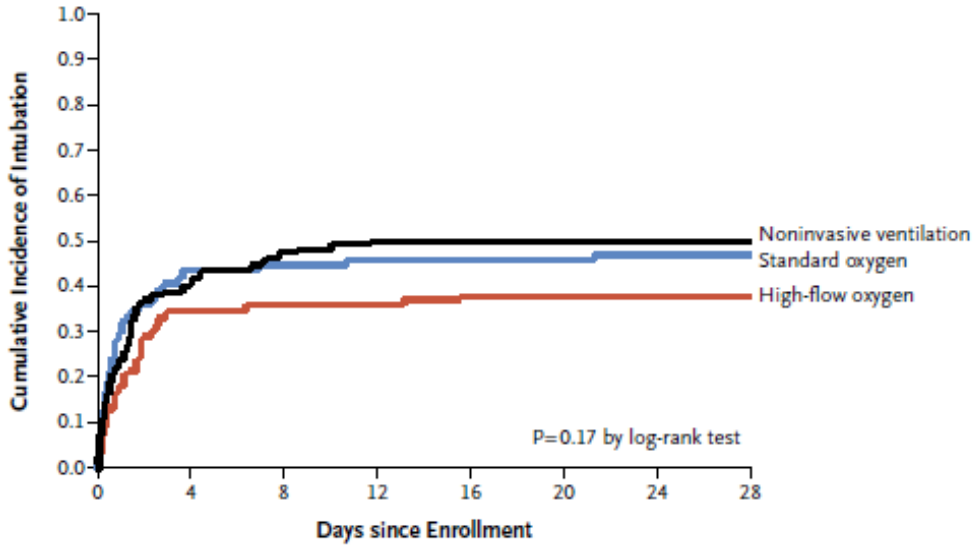
Table 1 Physiological benefits of high-flow nasal cannula oxygenation (HFNCO) compared to conventional oxygen therapy

FiO_2 values are higher and more stable
Because the delivered flow is higher than the spontaneous inspiratory demand and because the difference between the delivered flow rate and the patient's inspiratory flow rate is smaller
The flow must be set to match the patient's inspiratory demand and/or the severity of the respiratory distress
The anatomical dead space is decreased via washout of the nasopharyngeal space
Consequently, a larger fraction of the minute ventilation participates in gas exchange
Respiratory efforts become more efficient
Thoracoabdominal synchrony improves
The work of breathing is decreased
Because HFNCO mechanically stents the airway
Provides flow rates that match the patient's inspiratory flow, and markedly attenuates the inspiratory resistance associated with the nasopharynx, thereby reducing the work of breathing
The gas delivered is heated and humidified
Warm humid gas reduces the work of breathing and improves mucociliary function, thereby facilitating secretion clearance, decreasing the risk of atelectasis, and improving the ventilation/perfusion ratio and oxygenation
The body is spared the energy cost of warming and humidifying the inspired gas (neonates +++)
Warm humid gas is associated with better conductance and pulmonary compliance compared to dry, cooler gas
HFNCO delivers adequately warmed and humidified gas only when the flow is >40 L/min
Positive airway pressures are increased
The nasal cannula generates continuous positive pressures in the pharynx of up to 8 cmH_2O, depending or flow and mouth opening
The positive pressure distends the lungs, ensuring lung recruitment and decreasing the ventilation–perfusion mismatch in the lungs
End-expiratory lung volume is greater with HFNO than with low-flow oxygen therapy
Minimizing leaks around the cannula prongs is of the utmost importance

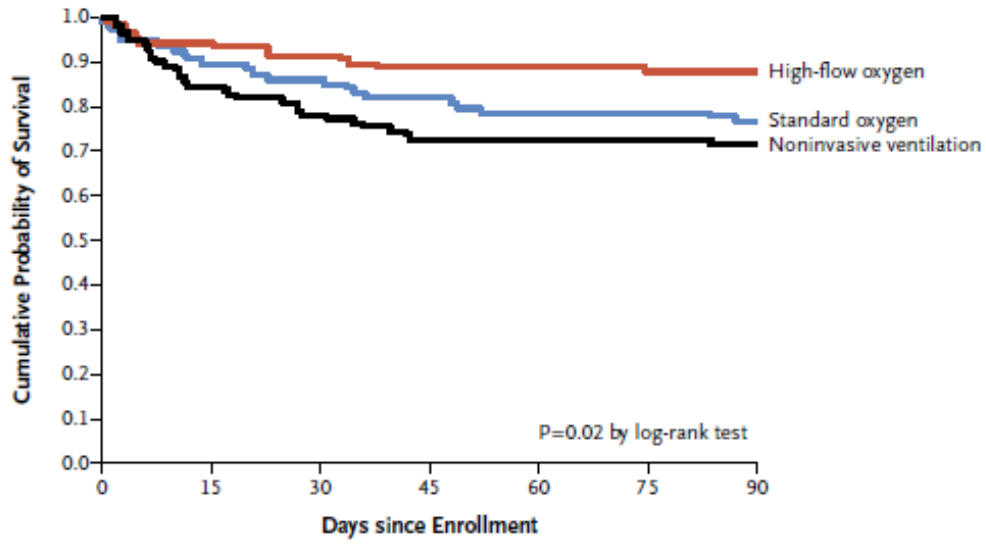
Intensive Care Med. 2016 Sep;42(9):1336-49

High-Flow Oxygen through Nasal Cannula in Acute Hypoxemic Respiratory Failure

A Overall Population



No. at Risk								
High-flow oxygen	106	68	67	67	65	65	65	65
Standard oxygen	94	52	50	49	49	49	48	48
Noninvasive ventilation	110	64	57	53	53	53	53	52



No. at Risk							
High-flow oxygen	106	100	97	94	94	93	93
Standard oxygen	94	84	81	77	74	73	72
Noninvasive ventilation	110	93	86	80	79	78	77

Frat JP, N Engl J Med. 2015 Jun 4;372(23):2185-96

High-Flow Oxygen through Nasal Cannula in Acute Hypoxemic Respiratory Failure

- Effet bénéfique de l'optiflow
  - Mortalité hospitalière de 11%...
- Effet délétère de la VNI?
  - Objectif primaire non atteint (intubation à J28)
    - Manque de puissance?
  - Objectif 2^{aire} (mortalité à J90)
    - 5 patients rendent l'étude significative
    - VILI
      - Vt = 9.2 ± 3.0 ml/kg
      - Durée de VNI > 8h

Frat JP, N Engl J Med. 2015 Jun 4;372(23):2185-96

Failure of Noninvasive Ventilation for De Novo Acute Hypoxemic Respiratory Failure: Role of Tidal Volume*

Guillaume Carteaux, MD[1,2,3]; Teresa Millán-Guilarte, MD[4]; Nicolas De Prost, MD, PhD[1,2,3]; Keyvan Razazi, MD[1,2,3]; Shariq Abid, MD, PhD[3]; Arnaud W. Thille, MD, PhD[5]; Frédérique Schortgen, MD, PhD[1,3]; Laurent Brochard, MD[3,6,7]; Christian Brun-Buisson, MD[1,2,8]; Armand Mekontso Dessap, MD, PhD[1,2,3]

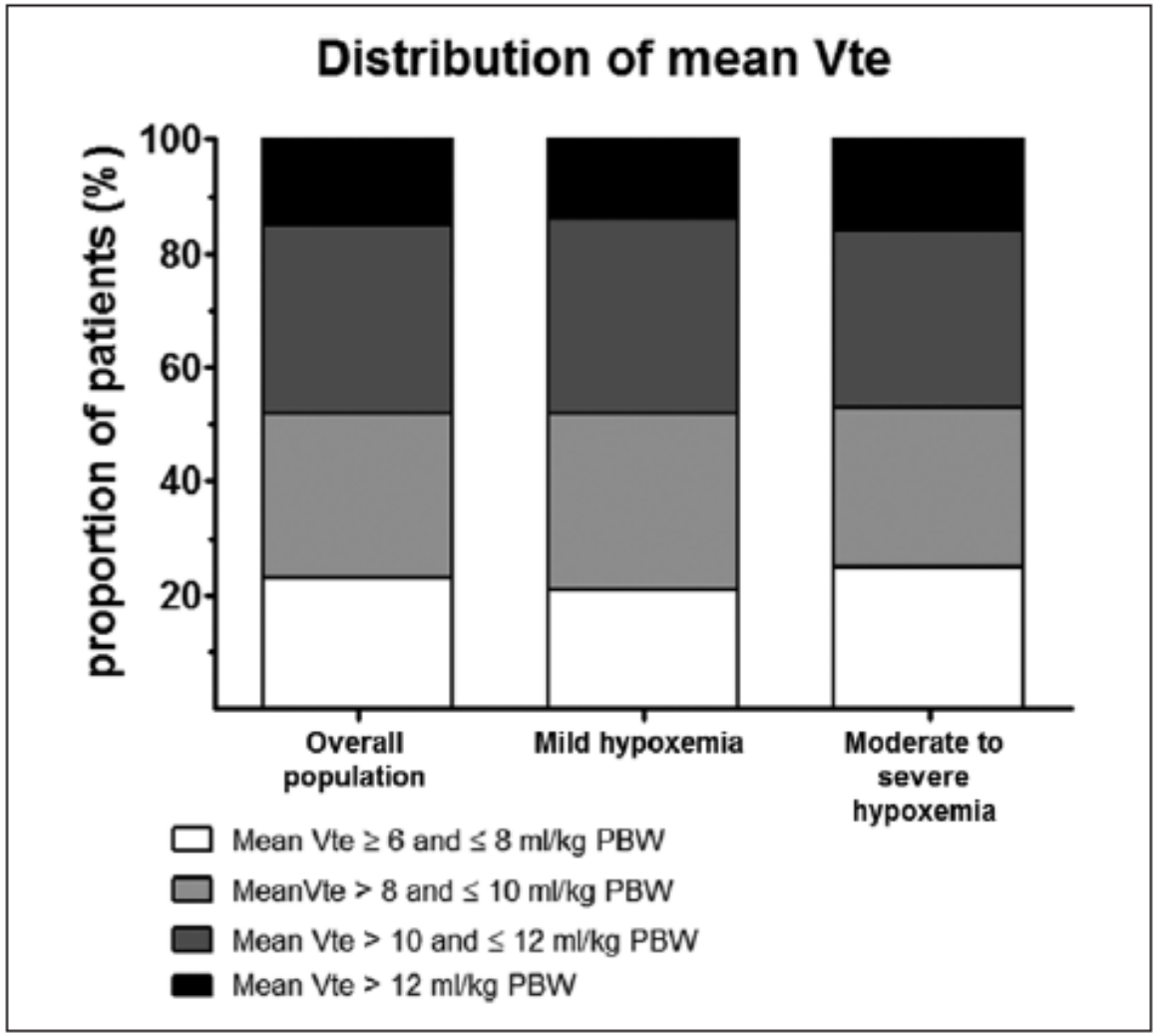
TABLE 3. Multivariate Analysis of Risk Factors for Noninvasive Ventilation Failure in Patients With De Novo Acute Hypoxemic Respiratory Failure

Risk Factors	Unadjusted Hazard Ratio (95% CI)	*p*	Adjusted Hazard Ratio (95% CI)[a]	*p*
Simplified Acute Physiology Score II (30)	1.026 (1.008–1.043)	0.011	1.024 (1.007–1.041)	0.013
Immunosuppression	2.207 (1.054–4.622)	0.045	1.351 (0.598–3.056)	0.476
Pao_2/Fio_2 before NIV	0.995 (0.990–1.001)	0.114	0.995 (0.989–1.001)	0.109
Mean expired tidal volume during NIV, per mL/kg predicted body weight	1.318 (1.109–1.567)	0.002	1.286 (1.069–1.547)	0.008

CCM 2016; 44:282-290

Failure of Noninvasive Ventilation for De Novo Acute Hypoxemic Respiratory Failure: Role of Tidal Volume*

Guillaume Carteaux, MD[1,2,3]; Teresa Millán-Guilarte, MD[4]; Nicolas De Prost, MD, PhD[1,2,3]; Keyvan Razazi, MD[1,2,3]; Shariq Abid, MD, PhD[3]; Arnaud W. Thille, MD, PhD[5]; Frédérique Schortgen, MD, PhD[1,3]; Laurent Brochard, MD[3,6,7]; Christian Brun-Buisson, MD[1,2,8]; Armand Mekontso Dessap, MD, PhD[1,2,3]



CCM 2016; 44:282-290

Effect of non-invasive oxygenation strategies in immunocompromised patients with severe acute respiratory failure: a post-hoc analysis of a randomised trial

Jean-Pierre Frat, Stéphanie Ragot, Christophe Girault, Sébastien Perbet, Gwénael Prat, Thierry Boulain, Alexandre Demoule, Jean-Damien Ricard, Rémi Coudroy, René Robert, Alain Mercat, Laurent Brochard, Arnaud W Thille, for the REVA network

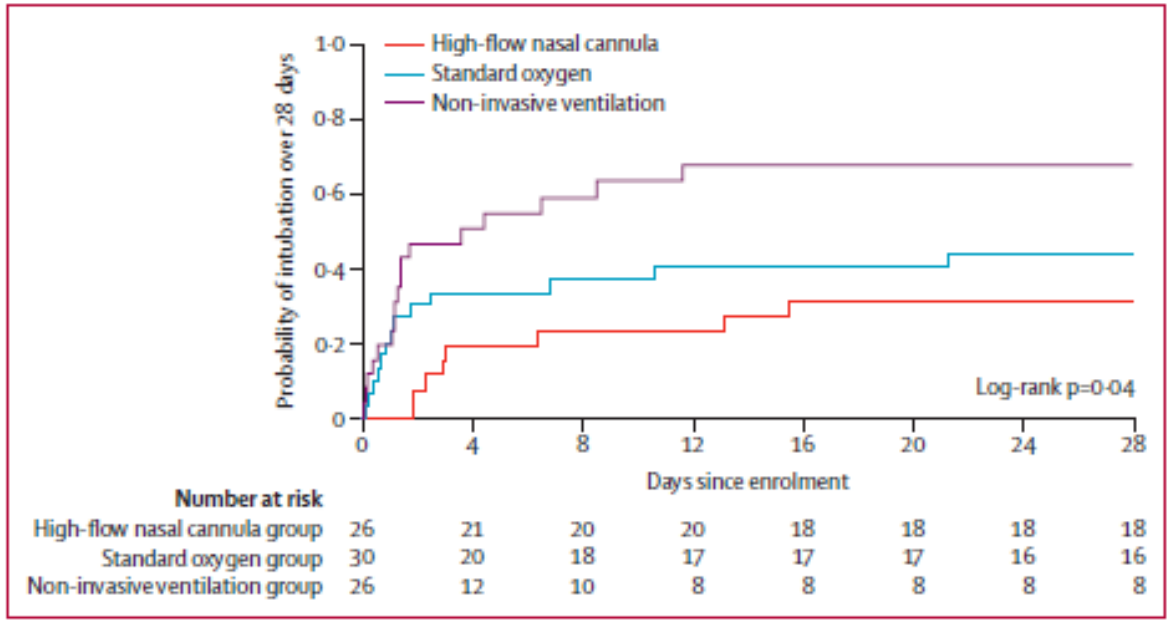


Figure 1: Probability of intubation at day 28 in patients in the non-invasive ventilation group versus standard oxygen and high-flow nasal cannula groups

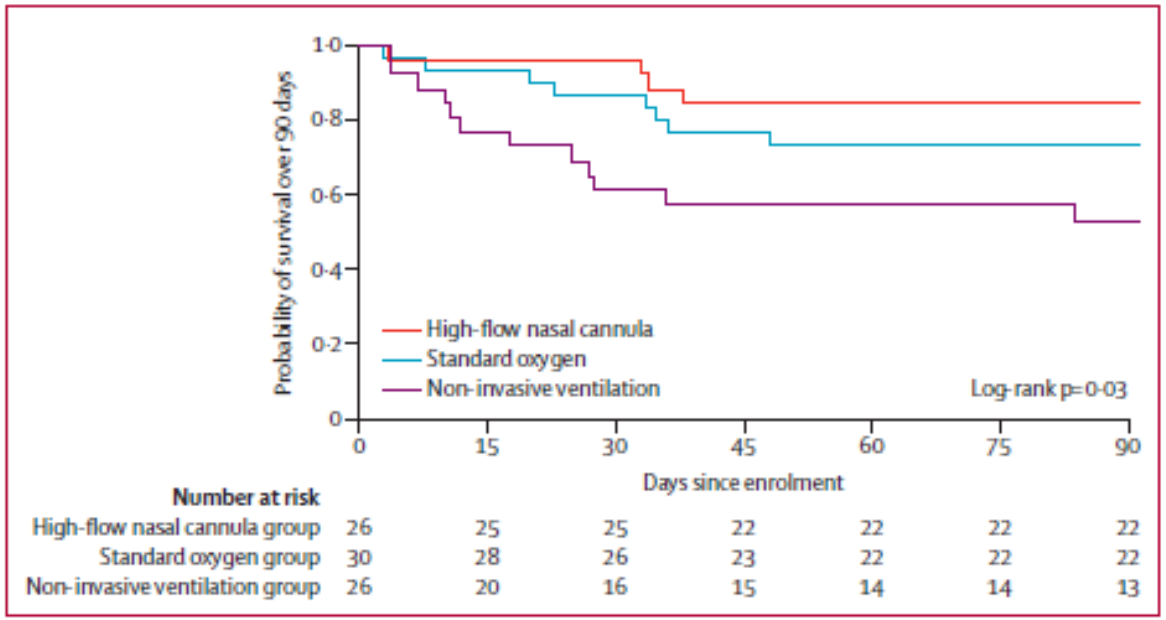


Figure 2: Probability of survival at day 90 in patients in the non-invasive ventilation group versus standard oxygen and high-flow nasal cannula groups

Lancet Respir Med. 2016 Aug;4(8):646-652

High-Flow Nasal Cannula Oxygenation in Immunocompromised Patients With Acute Hypoxemic Respiratory Failure: A Groupe de Recherche Respiratoire en Réanimation Onco-Hématologique Study

Lemiale V, Resche-Rigon M, Mokart D, Pène F, Argaud L, Mayaux J, Guitton C, Rabbat A, Girault C, Kouatchet A, Vincent F, Bruneel F, Nyunga M, Seguin A, Klouche K, Colin G, Kontar L, Perez P, Meert AP, Benoit DD, Papazian L, Demoule A, Chevret S, Azoulay E.

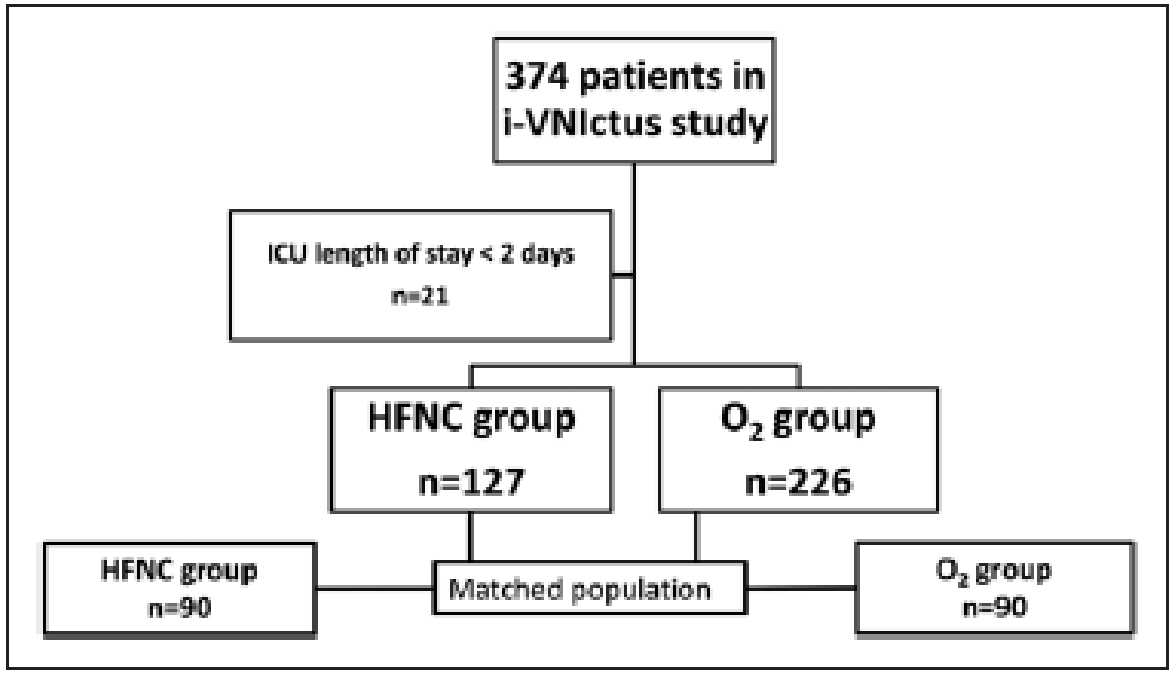
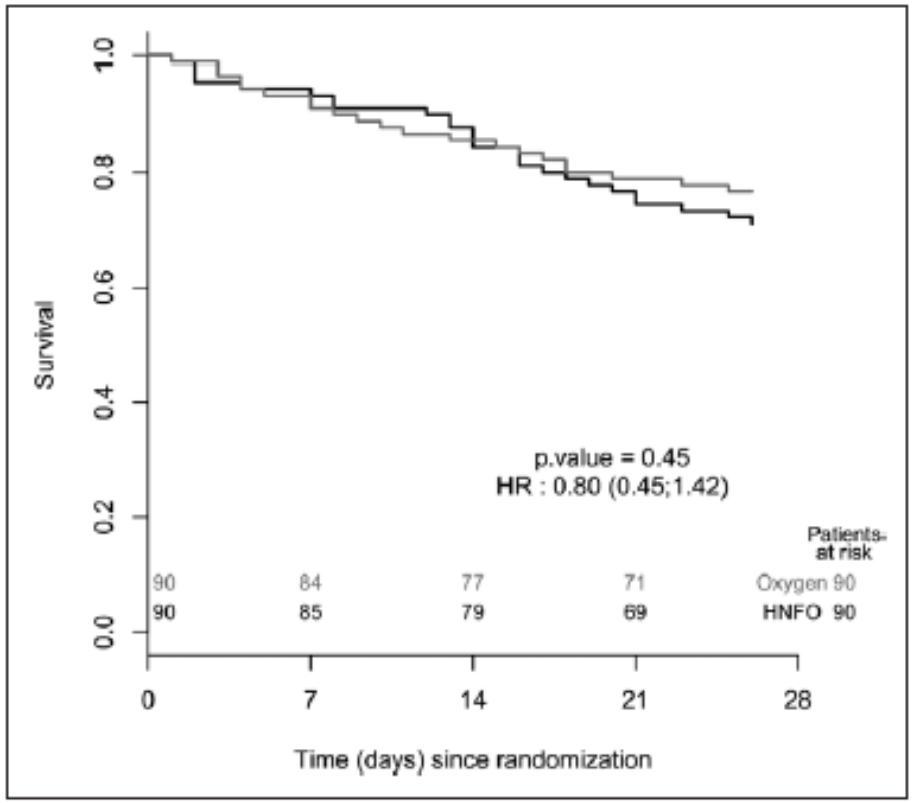


Figure 1. Patient diagram. HFNC = high-flow nasal cannula. O_2 = oxygen.



Crit Care Med. 2016 Sep 20

High-flow nasal cannula oxygen therapy versus noninvasive ventilation in immunocompromised patients with acute respiratory failure: an observational cohort study

Rémi Coudroy[1,2*], Angéline Jamet[1], Philippe Petua[1], René Robert[1,2], Jean-Pierre Frat[1,2] and Arnaud W. Thille[1,2]

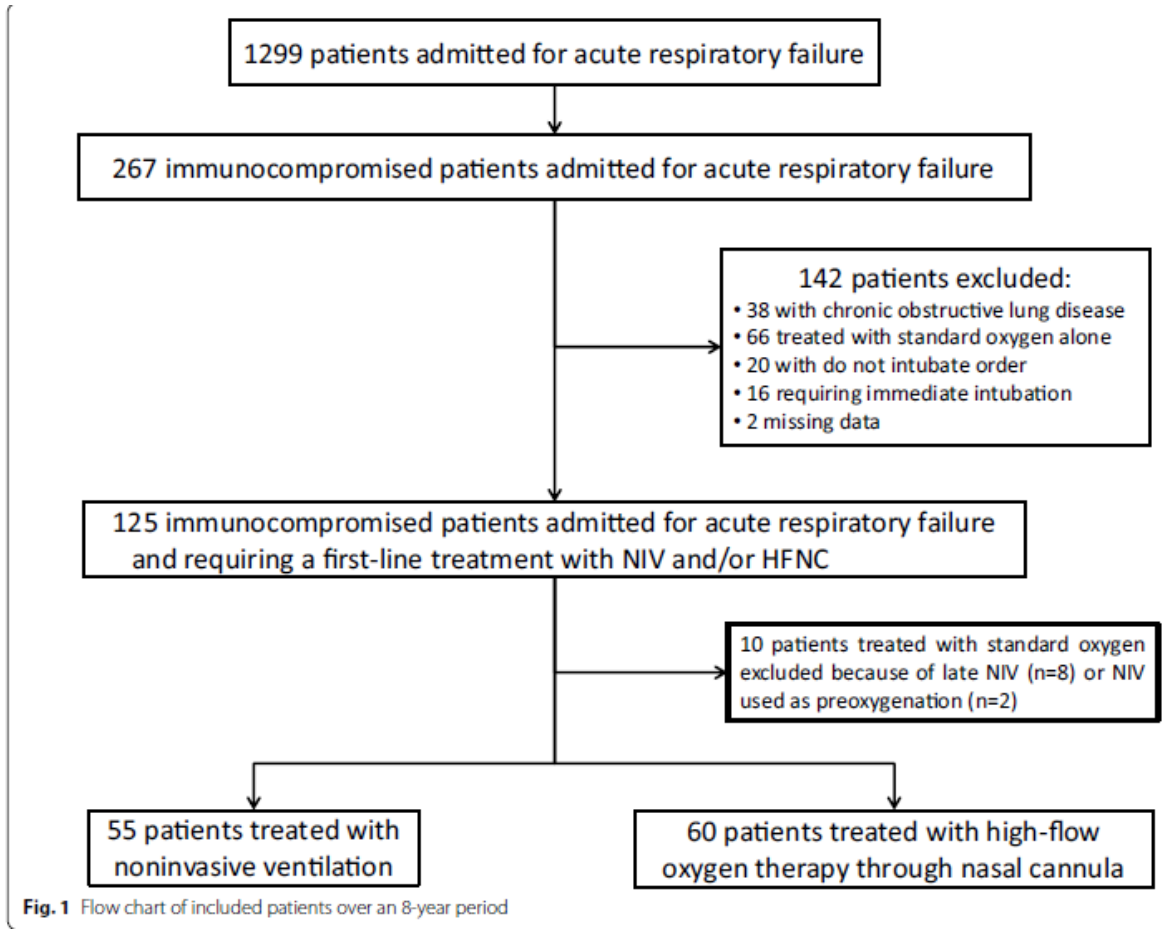


Fig. 1 Flow chart of included patients over an 8-year period

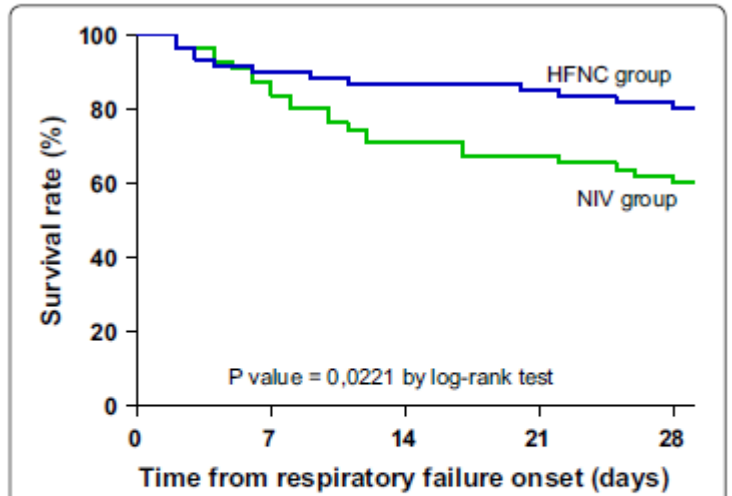


Fig. 2 Figure showing the Kaplan–Meier plots of the cumulative survival rates within the 28 days following the onset of acute respiratory failure in ICU in the overall population. The rate of mortality was significantly lower in patients treated with high-flow nasal cannula (HFNC) oxygen therapy alone (*blue line*) than in patients treated with noninvasive ventilation (NIV) as first-line therapy (*green line*), decreasing from 40 % (22/55) to 20 % (12/60) $p = 0.0221$ by log-rank test

Table 3 Multivariate analysis of variables associated with outcomes in the overall population

	Adjusted odds ratio (95 % CI)	*p* value
Variables independently associated with intubation[a]		
Simplified Acute Physiology Score II, per point	1.04 (1.00–1.08)	0.04
Noninvasive ventilation as a first-line therapy	3.25 (1.39–7.60)	0.007
Use of vasopressors within 24 h after ICU admission	4.12 (1.32–12.84)	0.02
Variables independently associated with mortality at day 28[b]		
Age (per year)	1.03 (1.00–1.07)	0.04
Use of vasopressors within 24 h after ICU admission	2.83 (1.02–7.91)	0.047
Noninvasive ventilation as a first-line therapy	3.70 (1.49–9.19)	0.005

Coudroy *et al. Ann. Intensive Care (2016) 6:45*
DOI 10.1186/s13613-016-0151-7

High-flow nasal cannula oxygen therapy versus noninvasive ventilation in immunocompromised patients with acute respiratory failure: an observational cohort study

Rémi Coudroy[1,2*], Angéline Jamet[1], Philippe Petua[1], René Robert[1,2], Jean-Pierre Frat[1,2] and Arnaud W. Thille[1,2]

Table 4 Comparison of baseline characteristics and outcomes between propensity score-matched patients treated by noninvasive positive pressure ventilation (NIV) or high-flow nasal cannula (HFNC) oxygen therapy alone

	NIV ($n = 24$)	HFNC ($n = 33$)	p value
Age (years)	62 ± 11	62 ± 11	0.72
Gender (male)	18 (75 %)	17 (52 %)	0.13
Knaus chronic health status score			0.53
A	8 (33 %)	9 (27 %)	
B	6 (25 %)	11 (33 %)	
C	10 (42 %)	11 (33 %)	
D	0 (0.0 %)	2 (6.1 %)	
Mac Cabe classification			0.27
1	11 (46 %)	12 (36 %)	
2	6 (25 %)	15 (45 %)	
3	7 (29 %)	6 (18 %)	
SAPS II at ICU admission (points)	40 ± 11	44 ± 12	0.52
Modified SOFA score at inclusion (points)	1.5 (0.0–4.0)	3.0 (1.0–6.0)	0.44
Type of immunosuppression			0.19
Hematologic cancer or neutropenia	12 (50 %)	18 (55 %)	
Solid cancer	7 (29 %)	3 (9.1 %)	
Drug-induced immunosuppression	5 (21 %)	11 (33 %)	
Acquired immune deficiency syndrome	0 (0.0 %)	1 (3.0 %)	
Cause of respiratory failure			0.08
Documented infection	9 (38 %)	19 (58 %)	
Cardiogenic pulmonary edema	4 (27 %)	3 (9.1 %)	
Specific	6 (25 %)	1 (3.0 %)	
Other identified causes	2 (8.3 %)	6 (18 %)	
Not identified cause	3 (13 %)	4 (12 %)	
Vasopressors within 24 h after ICU admission	1 (4.2 %)	4 (12 %)	0.39
Time from admission to ventilatory support initiation (h)	1 (0–1)	1 (0–1)	0.98
Need for immunosuppressive drug during ICU stay	5 (21 %)	4 (12 %)	0.47
Admission before 2011	12 (50 %)	7 (21 %)	0.04
Primary outcome			
28-day mortality	10 (42 %)	5 (15 %)	0.03
Secondary outcomes			
Intubation	13 (54 %)	10 (30 %)	0.07
Mortality of intubated	10/13 (77 %)	4/10 (40 %)	0.07
Time from admission to intubation (h)	48 (20–78)	35 (22–59)	>0.99
Length of invasive mechanical ventilation (days)	8 (5–18)	5 (3–10)	>0.99

Coudroy *et al. Ann. Intensive Care (2016) 6:45*
DOI 10.1186/s13613-016-0151-7

High-flow oxygen therapy in cancer patients with acute respiratory failure

Mokart D, Geay C, Chow-Chine L, Brun JP, Faucher M, Blache JL, Bisbal M, Sannini A.

	HFNC-NIV (n= 69)	Others (n= 69)	p
During ICU stay			
Vasopressors	44 (64)	42 (61)	0.857
Evolution toward septic shock	10 (15)	24 (35)	**0.012**
RRT	10 (15)	15 (22)	0.257
Standard oxygen	-	63 (91%)	-
HFNC	69 (100)	6 (9)	-
NIV	69 (100)	54 (78)	0.049
Days with NIV	4 (3-5)	4 (4-6)	0.881
Intubation rate at Day 28	33 (48)	36 (52)	0.277
with PaO2:FiO2<200 at admission	29/63 (46)	29/57 (51)	0.396
PaO2:FiO2 ratio (intubation)	89 (58-147)	88 (74-121)	0.364
Time from admission to intubation (h)	30 (17-52)	13 (6-47)	0.251
with PaO2:FiO2<200 at admission	27 (16-52)	12 (6-47)	0.593
Ventilator-free days at day 28 ψ	19 (1.4)	14 (1.6)	**0.019**
Outcome			
Treatment limitations in ICU	18 (26)	21 (30)	0.435
ICU length of stay (d)	9 (5-15)	6 (3-12)	0.082
Hospital length of stay (d)	16 (9-32)	12 (5-19)	**0.016**
Day-28 mortality	25 (36%)	37 (54%)	**0.027**

Intensive Care Med. 2015 Nov;41(11):2008-10

High-flow oxygen therapy in cancer patients with acute respiratory failure

Mokart D, Geay C, Chow-Chine L, Brun JP, Faucher M, Blache JL, Bisbal M, Sannini A.

Frat immunodéprimés (HFNC-NIV)

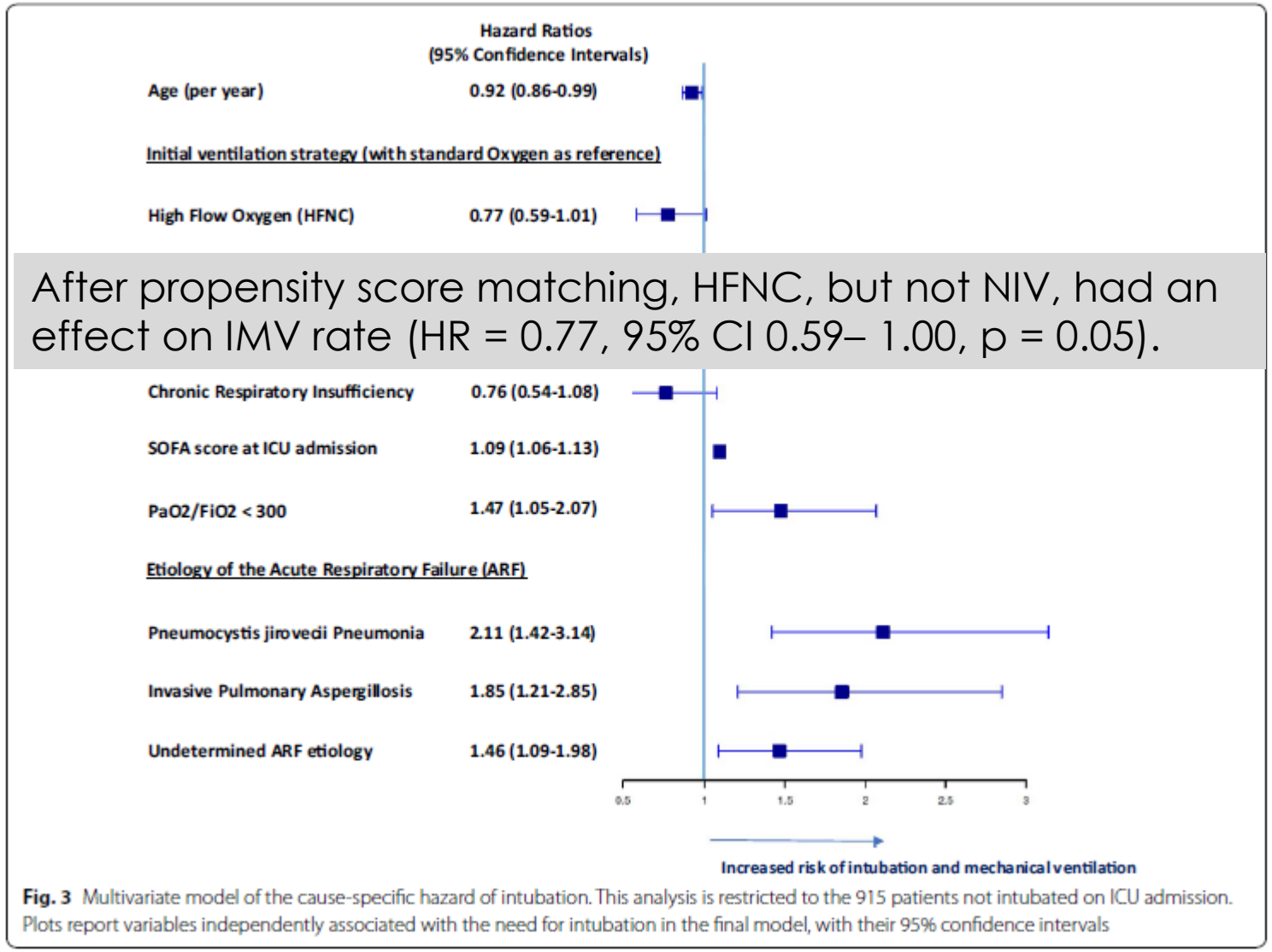
- SAPSII: 32
- PAFI: 149
- Intubation 65%
- VM free day (J28) :14j
- Mortalité J28: 42%
  - Durée VNI > 8h

Mokart (HFNC-NIV)

- SAPSII: 47
- PAFI: 128
- Intubation: 48%
- VM free day (J28): 19j
- Mortalité J28: 36%
  - Durée VNI < 6H

Intensive Care Med. 2015 Nov;41(11):2008-10

Acute hypoxemic respiratory failure in immunocompromised patients: the Efraim multinational prospective cohort study



After propensity score matching, HFNC, but not NIV, had an effect on IMV rate (HR = 0.77, 95% CI 0.59– 1.00, p = 0.05).

Fig. 3 Multivariate model of the cause-specific hazard of intubation. This analysis is restricted to the 915 patients not intubated on ICU admission. Plots report variables independently associated with the need for intubation in the final model, with their 95% confidence intervals

Intensive Care Med
DOI 10.1007/s00134-017-4947-1

Acute hypoxemic respiratory failure in immunocompromised patients: the Efraim multinational prospective cohort study

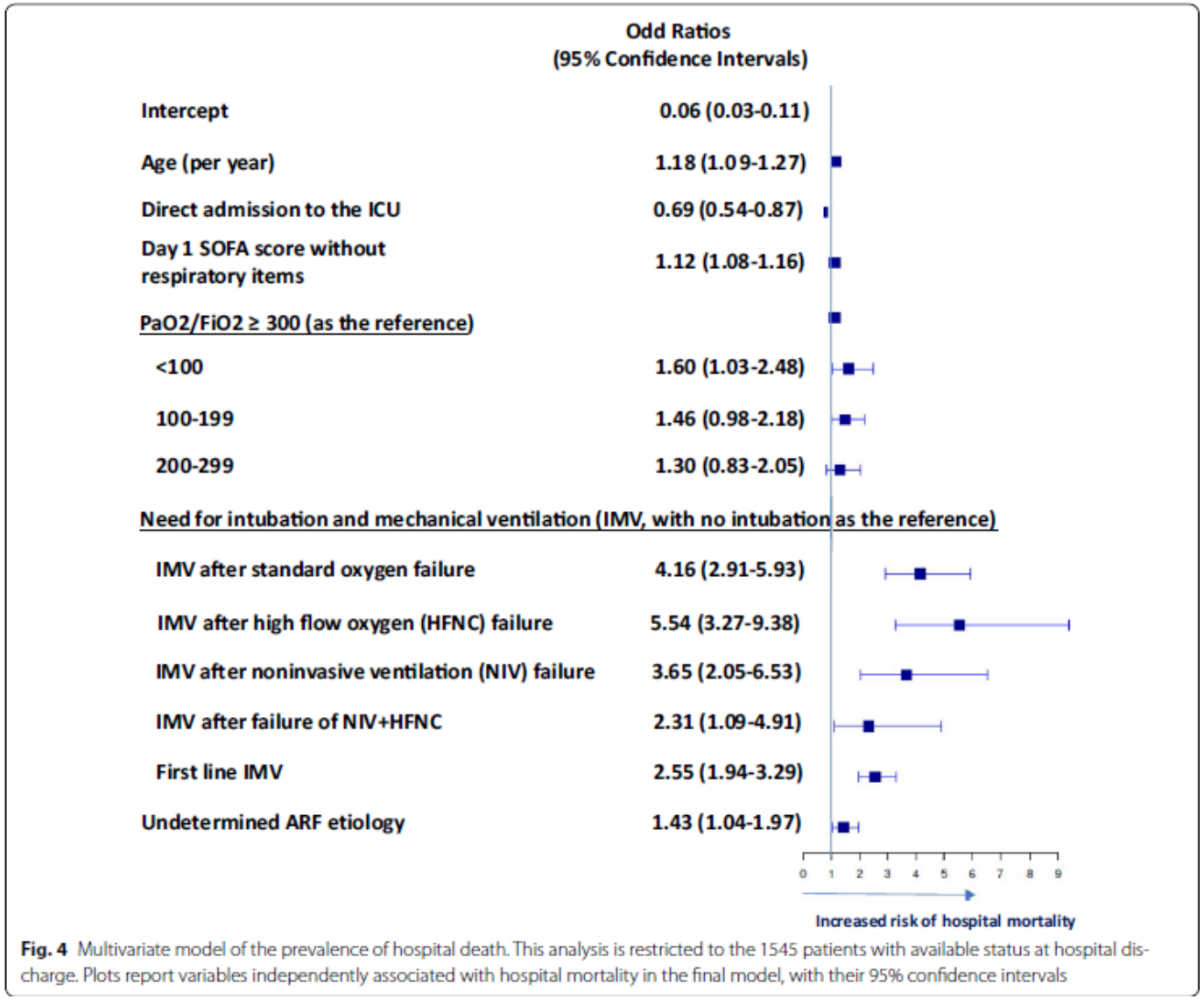
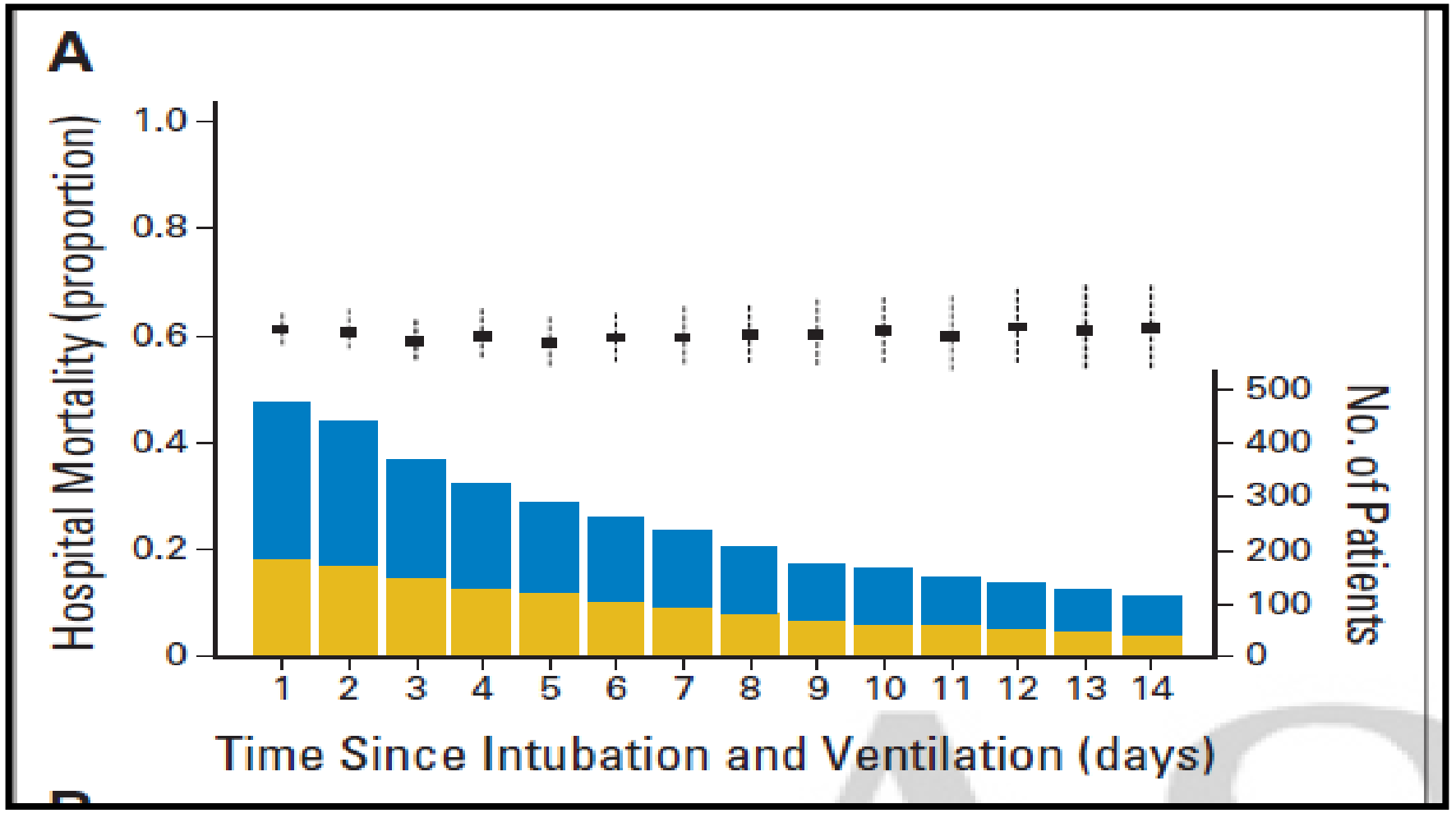


Fig. 4 Multivariate model of the prevalence of hospital death. This analysis is restricted to the 1545 patients with available status at hospital discharge. Plots report variables independently associated with hospital mortality in the final model, with their 95% confidence intervals

Intensive Care Med
DOI 10.1007/s00134-017-4947-1

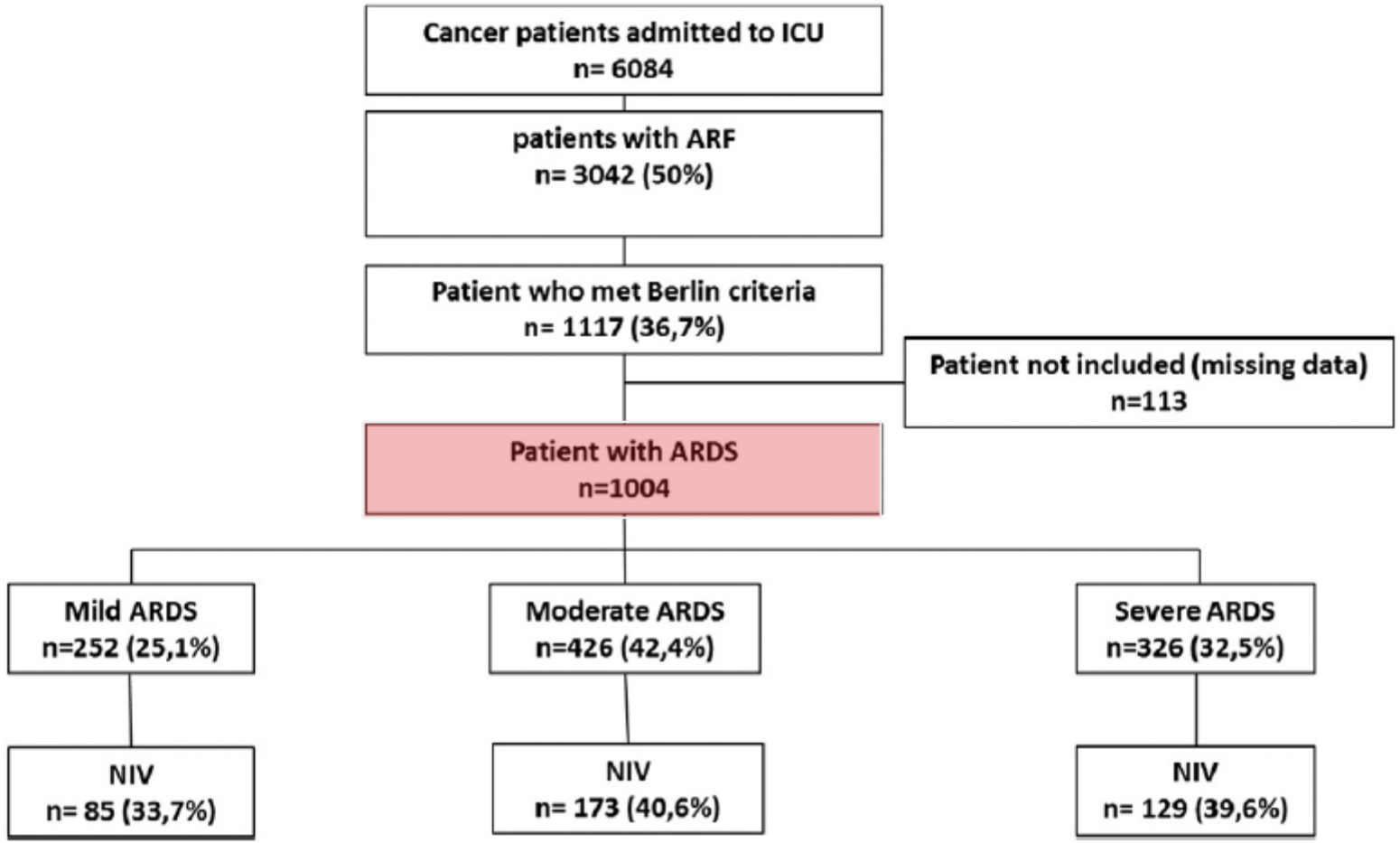
La ventilation mécanique mais pas la durée de VM



J Clin Oncol. 2013 Aug 1;31(22):2810-8.

Noninvasive ventilation during acute respiratory distress syndrome in patients with cancer: Trends in use and outcome

A. Neuschwander, MD [a], V. Lemiale, MD [a], M. Darmon, PhD [b], F. Pène, PhD [c], A. Kouatchet, MD [d], P. Perez, MD [e], F. Vincent, MD [f], J. Mayaux, MD [g], D. Benoit, PhD [h], F. Bruneel, MD [i], A.P. Meert, PhD [j], M. Nyunga, MD [k], A. Rabbat, MD [l], D. Mokart, PhD [m], E. Azoulay, PhD [a,*],
A Groupe de Recherche en Réanimation Respiratoire en Onco-Hématologie (GRRR-OH) study:



Journal of Critical Care 38 (2017) 295–299

Noninvasive ventilation during acute respiratory distress syndrome in patients with cancer: Trends in use and outcome

A. Neuschwander, MD [a], V. Lemiale, MD [a], M. Darmon, PhD [b], F. Pène, PhD [c], A. Kouatchet, MD [d], P. Perez, MD [e], F. Vincent, MD [f], J. Mayaux, MD [g], D. Benoit, PhD [h], F. Bruneel, MD [i], A.P. Meert, PhD [j], M. Nyunga, MD [k], A. Rabbat, MD [l], D. Mokart, PhD [m], E. Azoulay, PhD [a,*],
A Groupe de Recherche en Réanimation Respiratoire en Onco-Hématologie (GRRR-OH) study:

Patients characteristics according to NIV failure

Variables	NIV success (n = 111)	NIV failure (n = 276)	P
Baseline characteristics			
Age (y), median (IQR)	56 [46-65]	57 [46-67]	.40
Sex, male	46 (41.4)	92 (33.3)	.17
Underlying disease			.32
Hematologic malignancy	107 (96.9)	257 (93.1)	
Solid tumor	4 (3.6)	19 (6.8)	
Allogenic stem cell transplantation	22 (19.8)	38 (13.8)	.18
ARDS etiology			
Pulmonary Infection	74 (66.6)	209 (75.7)	.09
Extrapulmonary infection	20 (18.1)	35 (12.7)	.20
Fungus	19 (17.1)	79 (28.6)	.02
Pneumocystis	23 (20.7)	25 (9.1)	.003
Undetermined	11 (0.09)	15 (0.05)	.11
Neutropenia recovery	34 (30.6)	122 (44.2)	.019
SOFAc J1, median (IQR)	7 [3-8]	8 [5-10]	<.001
Shock	21 (18.9)	208 (75.4)	<.001
Acute kidney failure	2 (1.8)	85 (30.8)	<.001
Severity of ARDS			
Mild	31 (27.9)	54 (19.6)	.13
Moderate	53 (47.8)	120 (43.4)	
Severe	27 (24.3)	102 (36.9)	

SOFAc indicates SOFA score without respiratory parameter.

Factors associated with hospital mortality

	OR (95% CI)	P
Solid tumor (vs hematologic malignancy)	0.45 (0.19-1.09)	.08
Mild ARDS	1	
Moderate ARDS	0.92 (0.53-1.60)	.77
Severe ARDS	1.99 (1.09-4.28)	.02
SOFAc	1.11 (1.04-1.19)	.001
NIV failure	2.63 (1.63-4.28)	<.001
Extrapulmonary infection	1.78 (0.94-3.37)	.08

SOFAc indicates SOFA score without respiratory parameter.

Journal of Critical Care 38 (2017) 295–299

Intensive Care Med (2015) 41:623–632
DOI 10.1007/s00134-015-3693-5

ORIGINAL

Byung Ju Kang
Younsuck Koh
Chae-Man Lim
Jin Won Huh
Seunghee Baek
Myongja Han
Hyun-Suk Seo
Hee Jung Suh
Ga Jin Seo
Eun Young Kim
Sang-Bum Hong

Failure of high-flow nasal cannula therapy may delay intubation and increase mortality

Methods:

- Retrospective study:,January 2013-March 2014
- All patients who received HFNC and than required intubation
- 2 groups:

  early intubation (within 48 h) or late (at least 48 h) after commencing HFNC.

Results

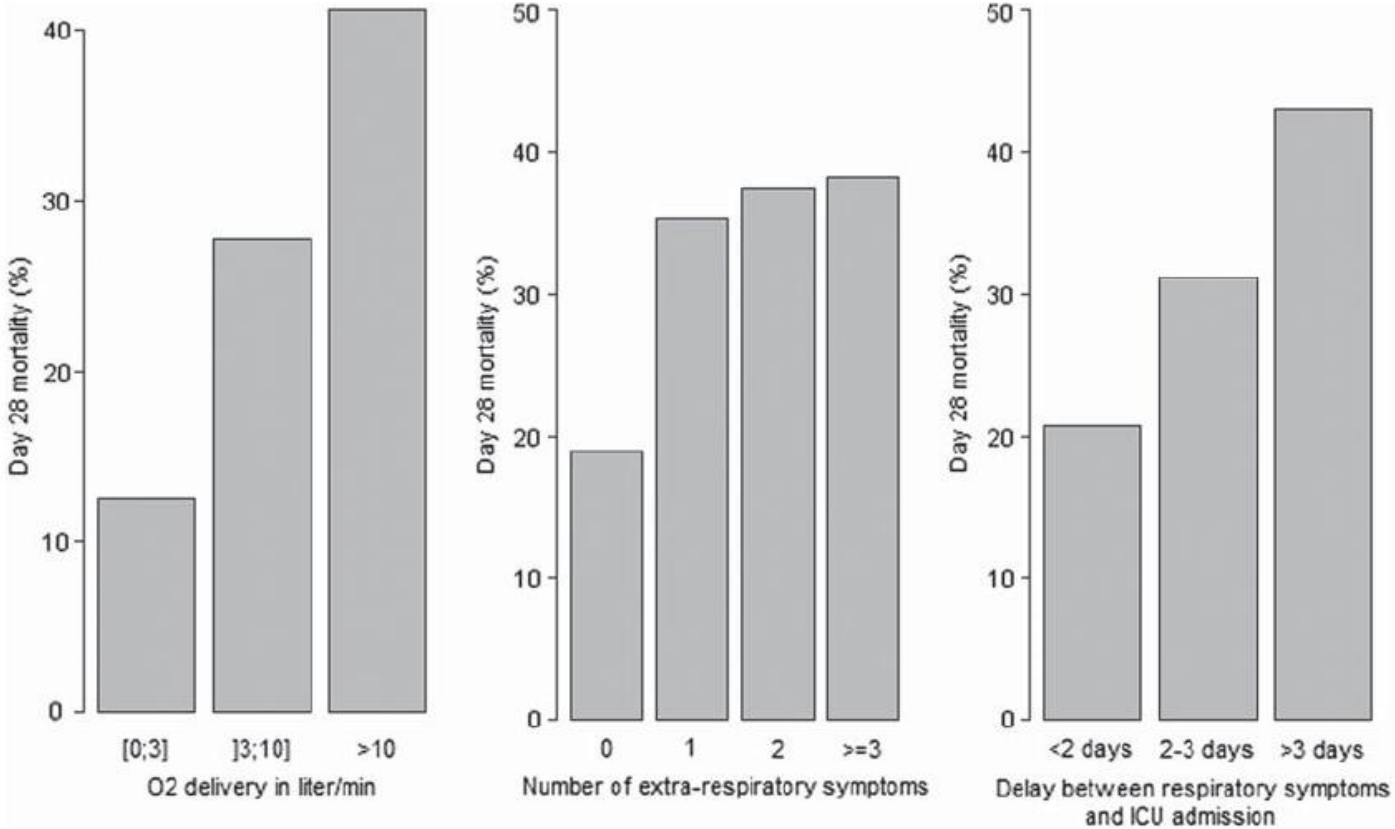
- 175 enrolled patients,
- 130 (74.3 %) and 45 (25.7 %) were intubated before and after 48 h of HFNC
- The groups were similar in terms of most baseline characteristics.

	Early Intubation N = 130 (74.3%)	**Late Intubation N = 45 (25,7%**	**P**
ICU Mortality (%)	39,2	66,7	0,001
Extubation success (%)	37,7	15, 6	0,006
Ventilator weaning (%)	55,4	28,9	0,002
Ventilator-Free days	8,6 + 10,1	3,6 + 7,5	0,011

- propensity-adjusted and -matched analysis, early intubation was also associated with better overall ICU mortality [adjusted odds ratio (OR) = 0.317, P = 0.005; matched OR = 0.369, P = 0.046]

Delayed intensive care unit admission is associated with increased mortality in patients with cancer with acute respiratory failure

Djamel Mokart[1], Jérôme Lambert[2], David Schnell[3], Louis Fouché[1], Antoine Rabbat[4], Achille Kouatchet[5], Virginie Lemiale[6], François Vincent[7], Etienne Lengliné[3], Fabrice Bruneel[8], Frederic Pene[6], Sylvie Chevret[2] & Elie Azoulay[3]



Leukemia & Lymphoma, August 2013; 54(8): 1724–1729

RESEARCH ARTICLE

Respiratory events in ward are associated with later intensive care unit (ICU) admission and hospital mortality in onco-hematology patients not admitted to ICU after a first request

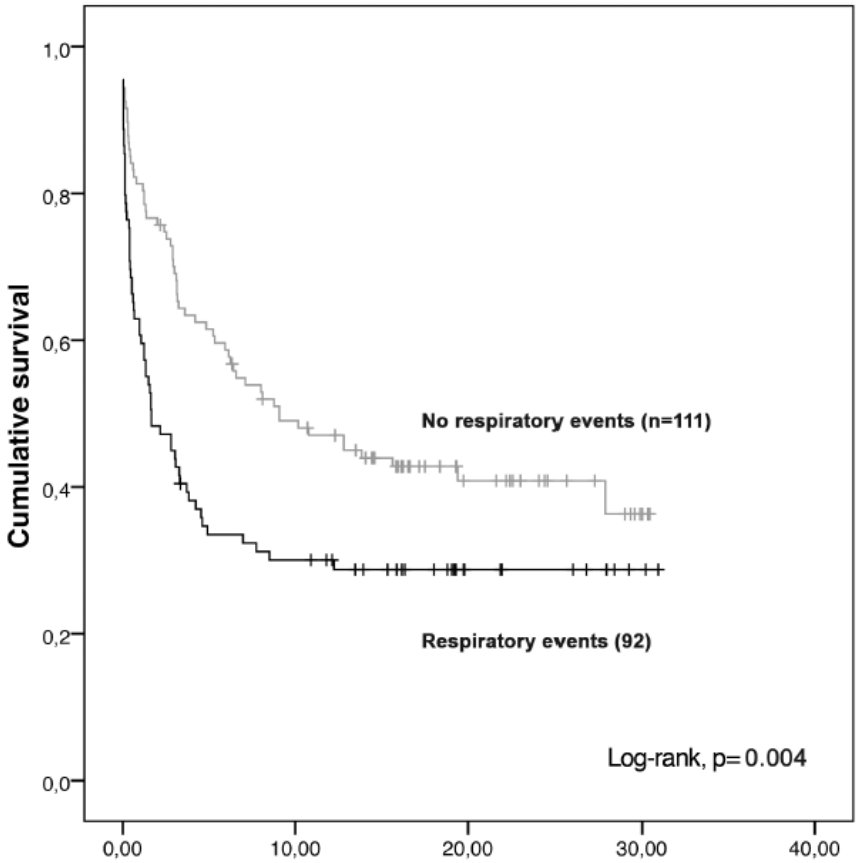
Laure Doukhan, Magali Bisbal, Laurent Chow-Chine, Antoine Sannini, Jean Paul Brun, Sylvie Cambon, Lam Nguyen Duong, Marion Faucher, Djamel Mokart*

Factors associated with a later ICU admission among initially not admitted patients.

Multivariate Analysis	OR	95% CI	P value
Clinical respiratory event	2,6	1,35–5,02	<0,01
Neutropenia	2,25	1,06–4,80	0,03
Former ICU stay[1]	2,75	1,12–6,75	0,03

Characteristics of initially not admitted patients according to hospital mortality.

Multivariate analysis	OR	95% CI	P value
Disease in progression	3,15	1,6–6,19	<0,01
Allogeneic HSCT	2.5	1.06–5.89	0.04
Clinical respiratory event	2,36	1,22–4,56	0,01
Severe sepsis	0,27	0,08–0,99	0,049



PLoS One 2017 Jul 27;12(7):e0181808. doi: 10.1371

DRA mixtes avec participation cardiaque

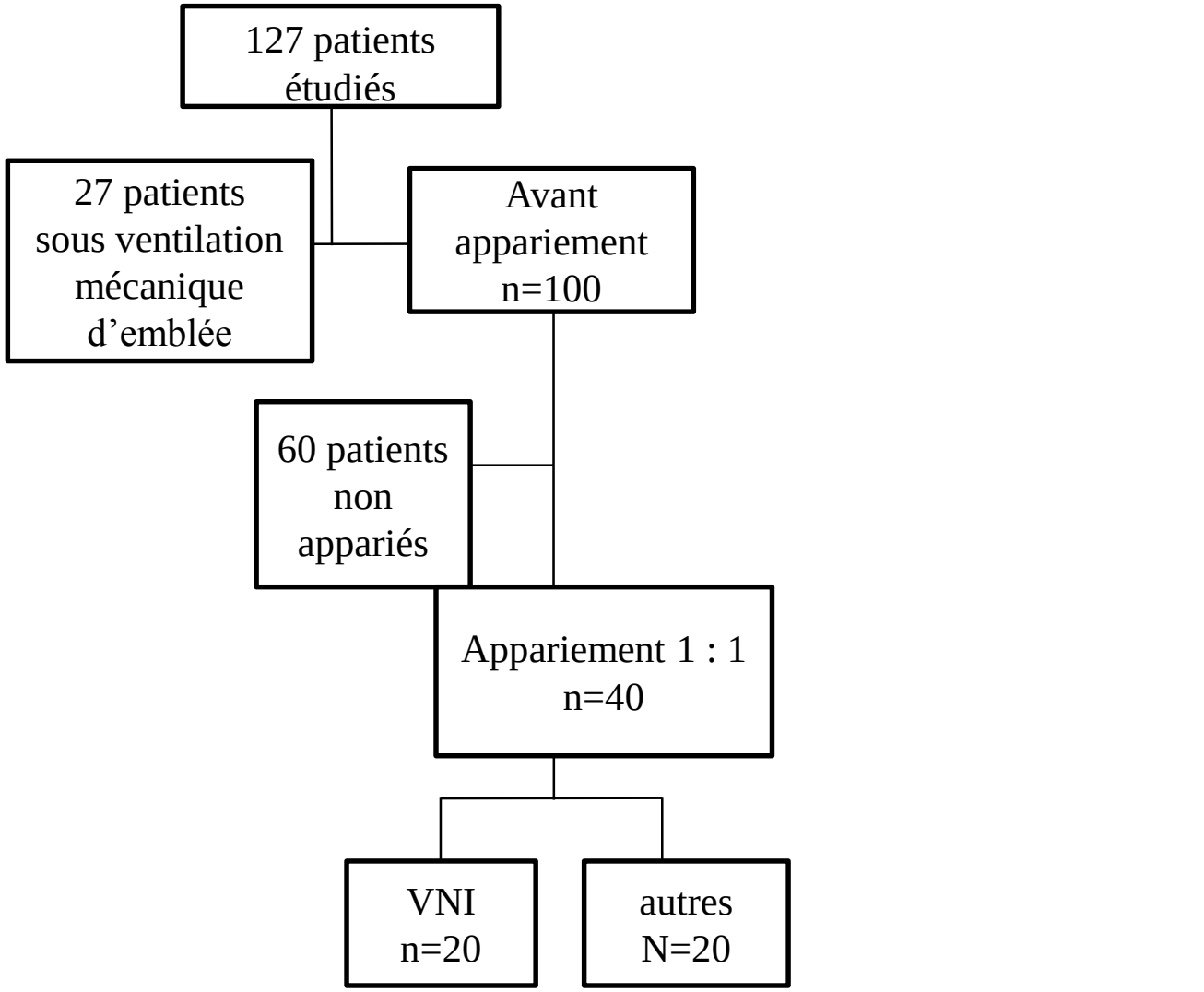
- DRA mixtes = 127/760 = 17%

VM immédiate	LHD	LHD + VNI	VNI + O2	O2
n = 27 (21%)	n = 8 (6%)	n = 37 (29%)	n = 26 (21%)	n = 29 (23%)

Mortalité en réanimation:

Mortalité en réanimation	Odds ratio	Intervalle de confiance à 95%	P
IGS II	**1,068 / point**	**1,032 – 1,105**	**< 0,001**
Mycoses invasives	**7,652**	**1,692 – 34,605**	**0,008**
VNI +O2 (référence)	**1**		**0,015**
OHD	**19,557**	**2,016 – 189,743**	**0,010**
Oxygénothérapie conventionnelle	**10,724**	**1,720 – 66,854**	**0,011**
VNI + OHD	3,020	0,503 – 18,144	0,227
VM d'emblée	2,436	0,347 – 17,074	0,370

Appariement score de propension pour VNI à J0



Mortalité réanimation	**VNI : 2 (10)**	**vs Autres: 10 (50)**	**P= 0,037**

Conclusion

- VNI vs OHD?
  - Quel type de VNI et pour qui ?
  - Quel type d'OHD et pour qui ?
  - Impact de l'intubation en temps variable temps-dépendante?
- Le groupe à risque =VM
  - Impact du type d'oxygénothérapie avant la VM?
  - Admissions précoces des DRA
- Etiologies +++