Management of acute respiratory failure (ARF) in immunocompromised patients

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No Conflict of Interest regarding the presentation …

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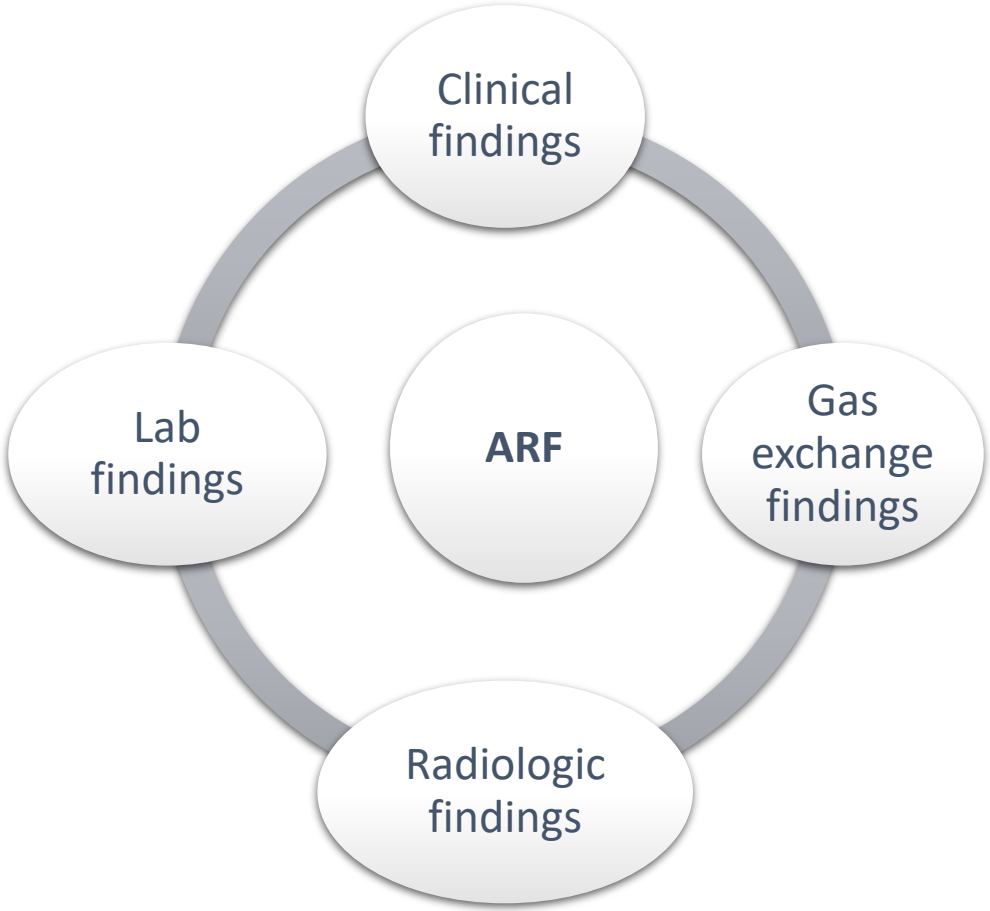
Acute Respiratory Failure

- Severe form of acute organ dysfunction characterized by impaired gas-exchange
  - $PaO_2/FiO_2 < 300$; $SpO_2/FiO_2 < 315$
- De novo / acute hypoxemic / Type 1 respiratory failure is the predominant type of ARF in immunocompromised patients
- Management
  - Restoration of oxygenation, and decrease the work of breathing
  - Appropriate diagnosis
    - Prediction
    - Diagnostic confirmation
  - Appropriate therapy of the underlying pathology



- Growing number of adults have immune dysfunction
  - Up to 5% of the general population are cancer survivors
  - Transplantation is on the rise
  - Immunosuppressant drugs and immunotherapy are used more
- ARF occurs in up to half of patients with hematological malignancies (AML and allogeneic HSCT) and 15% of those with solid tumours (lung cancer) or solid organ transplantation (heart and lung), with a mortality of 50%

- Immunosuppressed patients comprise 1/3rd of ICU admissions
  - > 3 mo or > 0.5 mg/kg/day steroid use
  - Other immunosuppressive agent use
  - Solid organ transplant patients
  - Chemotherapy for solid tumors within last 5 years
  - Hematologic malignancy
  - Primary immunodefficiencies


Acute respiratory failure in immunocompromised adults

Elie Azoulay, Djamel Mokart, Achille Kouatchet, Alexandre Demoule, Virginie Lemiale

Lancet Respir Med 2019; 7: 173–86


Diagnosis of severe respiratory infections in immunocompromised patients

Intensive Care Med (2020) 46:298–314

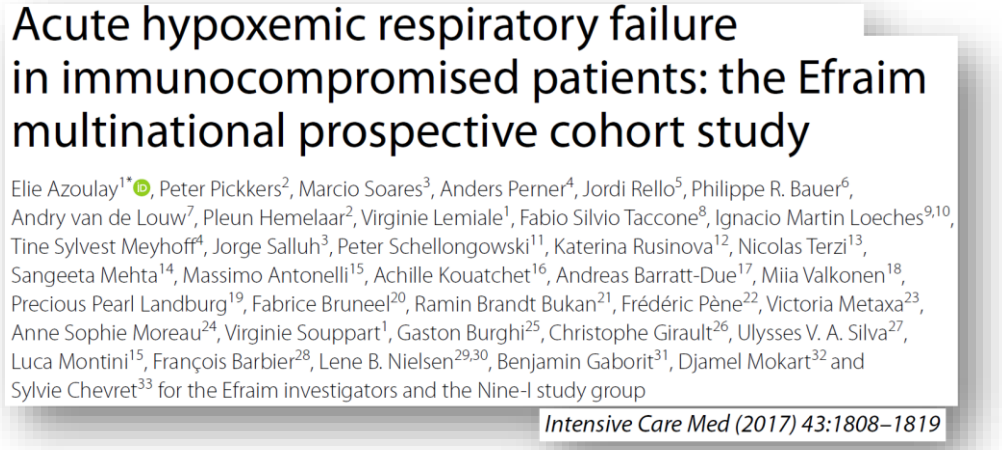
Elie Azoulay[1,2*], Lene Russell[3], Andry Van de Louw[4], Victoria Metaxa[5], Philippe Bauer[6], Pedro Povoa[7], José Garnacho Montero[8], Ignacio Martin Loeches[9], Sangeeta Mehta[10], Kathryn Puxty[11], Peter Schellongowski[12], Jordi Rello[13,14], Djamel Mokart[15], Virginie Lemiale[1] and Adrien Mirouse[1,2] on behalf of the Nine-i Investigators

Main causes of ARF in the immunocompromised host

- Disease related
  - Leukemic infiltration
  - Leukostasis
  - Lysis pneumopathy
  - Recovery phase of neutropenia
- Infections
- Treatment related
- Diffuse alveolar hemorrhage
- Cardiogenic pulmonary edema

Factors associated with mortality include …

1. Factors reflecting severity of ARF and associated organ dysfunctions
   - Degree of hypoxemia (PaO_2/FiO_2), tachypnea and respiratory distress
   - SOFA score
2. Factors related to the initial oxygenation and ventilation strategy
   - Patients requiring $\geq$ 6 L/min O_2 or FiO_2 > 40% $\rightarrow \uparrow$ intubation and hospital mortality (40%)
   - HFNO or NIV failure; Need for invasive mechanical ventilation
3. Factors related to the underlying disease and comorbid conditions
   - Older age, frailty or poor performance status
   - Degree of immunosuppression
4. Factors related to the cause of acute respiratory failure
   - Invasive fungal infection or unknown cause has worst prognosis
   - Cardiogenic pulmonary edema has the best prognosis
5. Factors related to delayed ICU admission



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

Elie Azoulay[1*], Peter Pickkers[2], Marcio Soares[3], Anders Perner[4], Jordi Rello[5], Philippe R. Bauer[6], Andry van de Louw[7], Pleun Hemelaar[2], Virginie Lemiale[1], Fabio Silvio Taccone[8], Ignacio Martin Loeches[9,10], Tine Sylvest Meyhoff[4], Jorge Salluh[3], Peter Schellongowski[11], Katerina Rusinova[12], Nicolas Terzi[13], Sangeeta Mehta[14], Massimo Antonelli[15], Achille Kouatchet[16], Andreas Barratt-Due[17], Miia Valkonen[18], Precious Pearl Landburg[19], Fabrice Bruneel[20], Ramin Brandt Bukan[21], Frédéric Pène[22], Victoria Metaxa[23], Anne Sophie Moreau[24], Virginie Souppart[1], Gaston Burghi[25], Christophe Girault[26], Ulysses V. A. Silva[27], Luca Montini[15], François Barbier[28], Lene B. Nielsen[29,30], Benjamin Gaborit[31], Djamel Mokart[32] and Sylvie Chevret[33] for the Efraim investigators and the Nine-I study group

Intensive Care Med (2017) 43:1808–1819

- 1611 patients
  - Hematological malignancies 52%
  - Solid tumors 35%
  - Systemic diseases 17%
  - Solid organ transplantation 9%
- Main etiologies
  - Bacterial 30%
  - Viral 15%
  - Fungal 15%
  - Undetermined 13%
- On admission 37% were intubated
- 57% not intubated
  - Standard O_2 54%
  - HFNC 20%
  - NIV 17%
  - NIV+HFNC 9%
- ICU mortality 32%,
- Hospital mortality 44%
- 90-day mortality 56%

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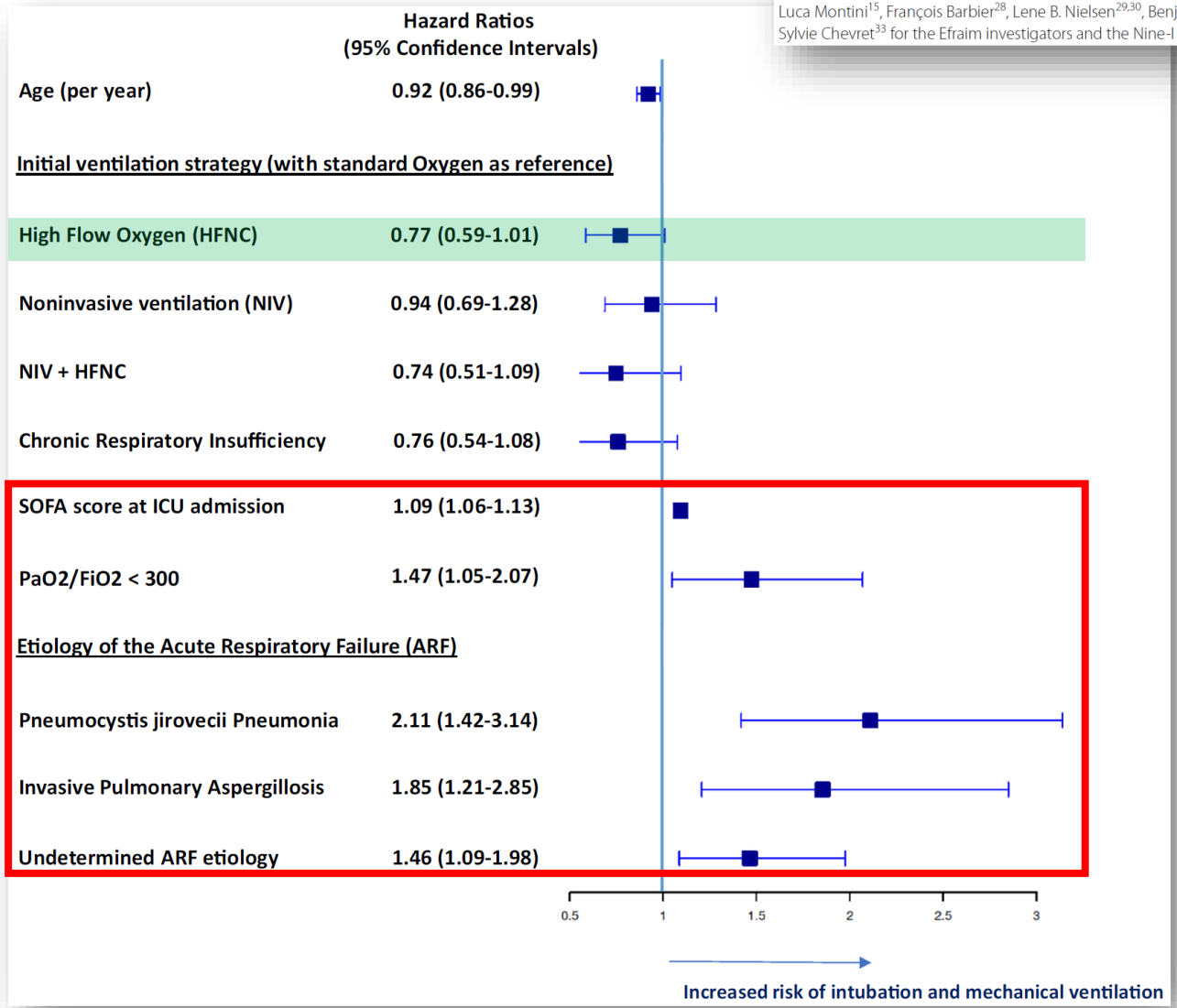

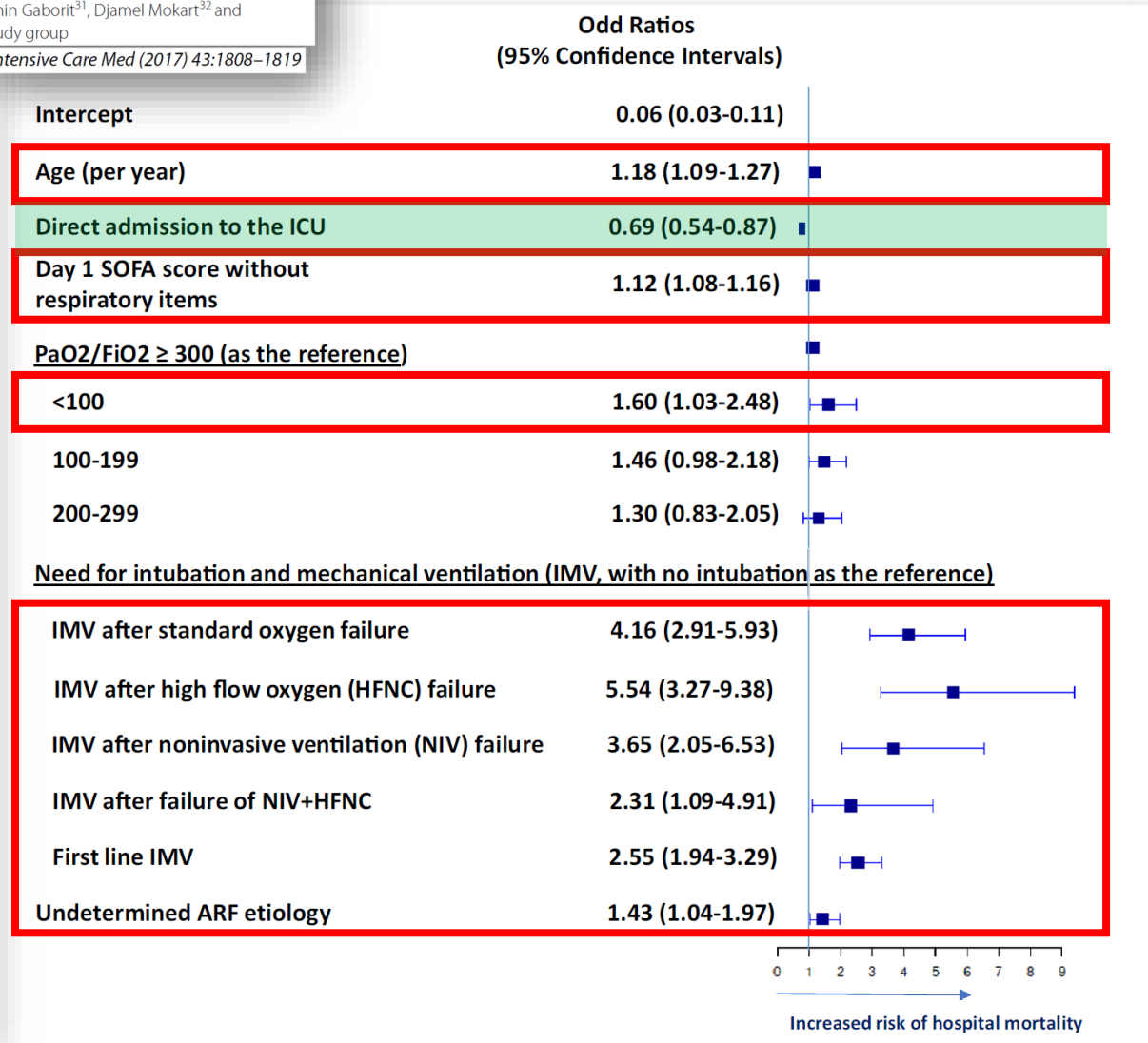

ICU-acquired pneumonia in immunosuppressed patients with acute hypoxemic respiratory failure: A post-hoc analysis of a prospective international cohort study

Journal of Critical Care 63 (2021) 243–245

Ignacio Martin-Loeches, MD [a,b,*,1], Michael Darmon, MD [c,1], Alexandre Demoule, MD [d], Massimo Antonelli, MD [e,f], Peter Schellongowski, MD [g], Peter Pickkers, MD [h], Marcio Soares, MD [i], Jordi Rello, MD [j], Philippe Bauer [k], Andry van de Louw, MD [l], Virgine Lemiale, MD [c], David Grimaldi, MD [m], Martin Balik, MD [n], Sangeeta Mehta, MD [o], Ac Kouatchet, MD [p], Andreas Barratt-Due, MD [q], Miia Valkonen, MD [r], Jean Reignier, MD [s], Victoria Metaxa, MD [t], Anne Sophie Moreau, MD [u], Gaston Burghi, MD [v], Djamel Mokart, MD [w], Elie Azoulay, MD [c], For the Efraim investigators and the Nine-I study group

- ICU-AP occurred in 10% of patients
- Hospital mortality was 15% in ICU-AP group vs 7% in no ICU-AP group ($p<0.001$)
- Vasopressors (OR 2.22 [1.46–3.39]) and invasive mechanical ventilation vs HFNC at day 1 (OR 2.12 [1.07–4.20]) were associated with increased risk of ICU-AP
- ICU-AP was independently associated with mortality (HR 1.48 [1.14–1.91]; P=0.003)

	Incidence of respiratory events	Need for ICU admission	Hospital respiratory mortality
Haematological malignancies			
Acute myeloid leukaemia[5,18–23]	22–84%	66%	45%
Acute lymphoblastic leukaemia[18,22,23]	7–18·5%	12–15%	38·5%
Lymphoproliferative diseases[5]	8%	8%	40-50%
Myelodysplastic syndrome[18]	29·4%	20%	17%
Autologous haemopoietic stem cell therapy[24,25]	3–28%	42%	3–55%
Allogeneic haemopoietic stem cell therapy[26,27]	24–30%	50%	51%
Prolonged neutropenia[6,28]	8–29·5%	11–16%	5–12%
Solid tumours			
Lung cancer[29,30]	26–50%	100%	11·2–60%
Other solid tumours[5,30,31]	0·7–10·3%	100%	6·1–55%
Patients on immunotherapy[32,33]	1·3–3·6%	1·3%*	..
Solid organ transplantation			
Lung transplantation[34]	14%	All	65%
Heart transplantation[35]	12·5%	All	76·5%
Kidney transplantation[36,37]	3·3–4·8%	All	16·4–22·5%

Acute respiratory failure in immunocompromised adults

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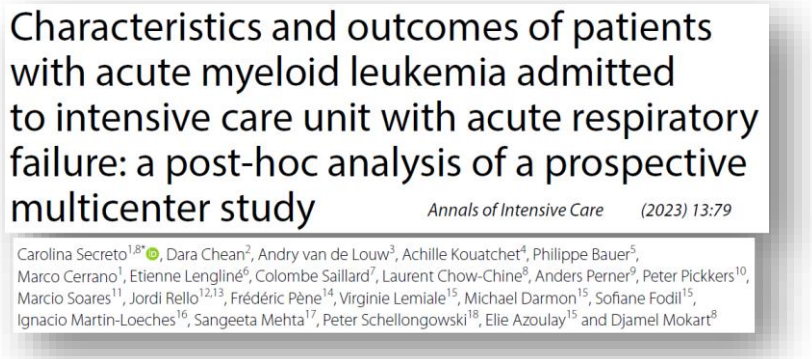
Lancet Respir Med 2019; 7: 173–86



Characteristics and outcomes of patients with acute myeloid leukemia admitted to intensive care unit with acute respiratory failure: a post-hoc analysis of a prospective multicenter study

Annals of Intensive Care (2023) 13:79

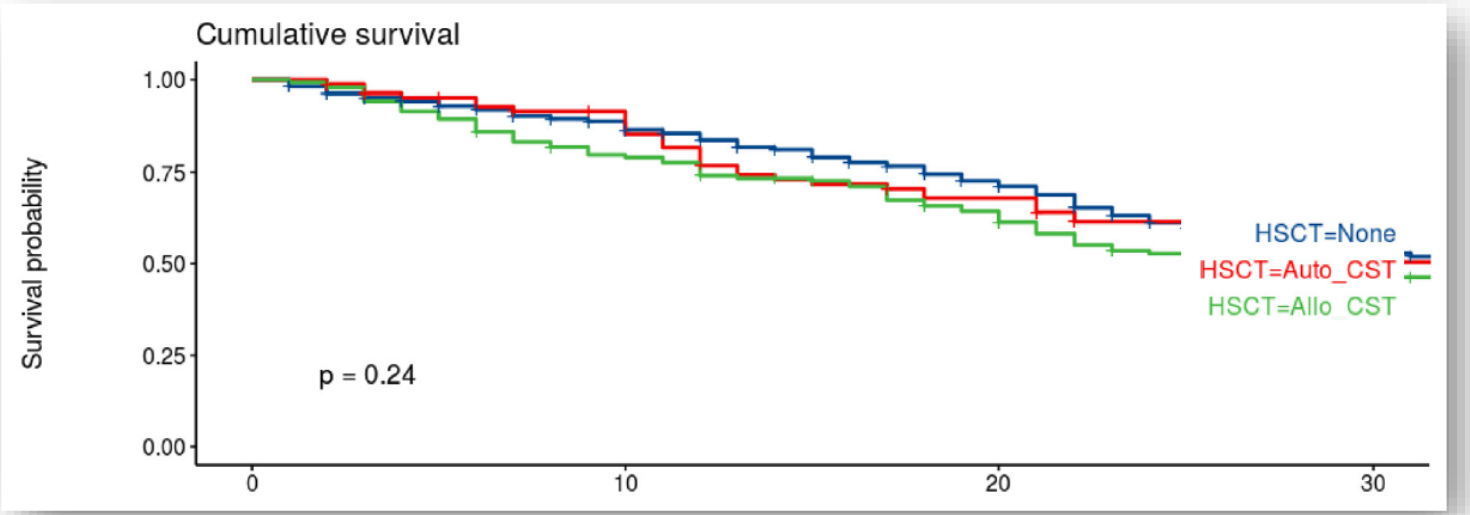
Carolina Secreto[1,8*], Dara Chean[2], Andry van de Louw[3], Achille Kouatchet[4], Philippe Bauer[5], Marco Cerrano[1], Etienne Lengliné[6], Colombe Saillard[7], Laurent Chow-Chine[8], Anders Perner[9], Peter Pickkers[10], Marcio Soares[11], Jordi Rello[12,13], Frédéric Pène[14], Virginie Lemiale[15], Michael Darmon[15], Sofiane Fodil[15], Ignacio Martin-Loeches[16], Sangeeta Mehta[17], Peter Schellongowski[18], Elie Azoulay[15] and Djamel Mokart[8]

- Post-hoc analysis of EFRAIM study on AML patients
- Hospital mortality 46.8%
- Variables independently associated with mortality
  - ECOG performance status ≥ 2 (OR = 2.79, *p* = 0.04)
  - Cough (OR = 2.94, *p* = 0.034)
  - Use of vasopressors (OR = 2.79, p = 0.044)
  - Leukemia-specific pulmonary involvement [namely leukostasis, pulmonary infiltration by blasts or acute lysis pneumopathy (OR = 4.76, *p* = 0.011)]
  - Liver SOFA score (OR = 1.85, *p* = 0.014)
- Focal alveolar chest X-ray pattern was associated with survival (OR = 0.13, *p* = 0.001)
- 3 clusters according to clinical, biological and radiological features were identified:
  - **Cluster 1 "leukemic cluster"**, isolated, milder ARF
  - Cluster 2 "pulmonary cluster", symptomatic, highly oxygen-requiring, severe ARF with diffuse radiological findings (mortality OR = 2.48, *p* = 0.04)
  - Cluster 3 "inflammatory cluster", multiorgan failures in addition to ARF (OR = 3.49, *p* = 0.006)

Acute Respiratory Failure Outcomes in Patients with Hematologic Malignancies and Hematopoietic Cell Transplant: A Secondary Analysis of the EFRAIM Study

Transplantation and Cellular Therapy 27 (2021) 78.e1–78.e6

Laveena Munshi[1,*], Michael Darmon[2], Marcio Soares[3], Peter Pickkers[4], Philippe Bauer[5], Anne-Pascale Meert[6], Ignacio Martin-Loeches[7,8], Thomas Staudinger[9], Frederic Pene[10], Massimo Antonelli[11,12], Andreas Barratt-Due[13], Alexandre Demoule[14], Victoria Metaxa[15], Virginie Lemiale[16], Fabio Taccone[17], Djamel Mokart[18], Elie Azoulay[16], Sangeeta Mehta[1] On Behalf of the EFRAIM Investigators



Multivariable Logistic Regression Analysis Demonstrating the Association Between HM without HCT versus Autologous HCT or Allogeneic HCT and Hospital Mortality

Variable	OR	95% CI	*P* Value
ECOG status 0	Reference	—	—
ECOG status 1	1.30	.77-2.18	.32
ECOG status 2	2.25	1.29-3.93	.04
ECOG status 3	5.33	2.86-9.94	<.001
BAL performed	1.35	1.02-1.56	.04
Vasopressors	2.76	1.83-4.15	<.001
Renal replacement therapy	3.07	1.90-4.94	<.001
Age (per 1 yr)	1.02	1.00-1.03	.03
HM no HCT	Reference	—	—
Autologous HCT	1.07	.57-2.03	.83
Allogeneic HCT	.99	.60-1.66	.98
Other etiologies	Reference	—	—
Fungal infection	1.43	.68-3.01	.34
Undetermined ARF	1.29	.70-2.40	.42

Etiologies and Outcome of Patients with Solid Tumors Admitted to ICU with Acute Respiratory Failure: A Secondary Analysis of the EFRAIM Study

Benguerfi et al. Respiratory Care 2023;68:740-748

- 529 had solid tumors: 33% lung cancer, 21% breast cancer 10%, GI cancer 9%
- Cause of admission: bacterial or viral infection 42%; cancer or treatment related 16%; extrapulmonary sepsis 12%, fungal infection 4%, unknown 12%
- Hospital mortality rate 46%. Independent factors related with mortality
  - Chronic cardiac failure OR 1.78 [1.09–2.92]
  - Lung cancer OR 2.50 [1.51–4.19]
  - Day 1 SOFA OR 1.97 [1.32-2.96]
  - Non-infectious etiologies OR 0.32 [0.16–0.61]

Etiologies and Outcomes of Acute Respiratory Failure in Solid Organ Transplant Recipients: Insight Into the EFRAIM Multicenter Cohort

Messika, et al. Transplantation Proceedings, 52, 2980e2987 (2020)

- 142 were SOT recipients; kidney 51%, lung 23%, liver 20%, heart 5%
- Invasive diagnostic strategy was more frequently performed in lung transplant recipients with a trend toward a higher rate of bacterial etiology in lung than kidney transplant recipients
- ICU survival 75%, hospital survival 63%, 90-day survival 55%; although statistically not significant lung tx patients had the worst prognosis
- SOFA score (OR 1.19 [1.06-1.33] and ECOG ≥ 3 4.26 [0.91-20.06]

Assessing the cause of ARF at the bedside

D	**D**uration of respiratory symptom
I	**I**mmunosuppression type
R	**R**adiological pattern (CXR, lung USG …)
E	**E**xperience of clinician regarding similar cases
C	**C**linical findings
T	**T**omography (HRCT)

Acute respiratory failure in immunocompromised adults

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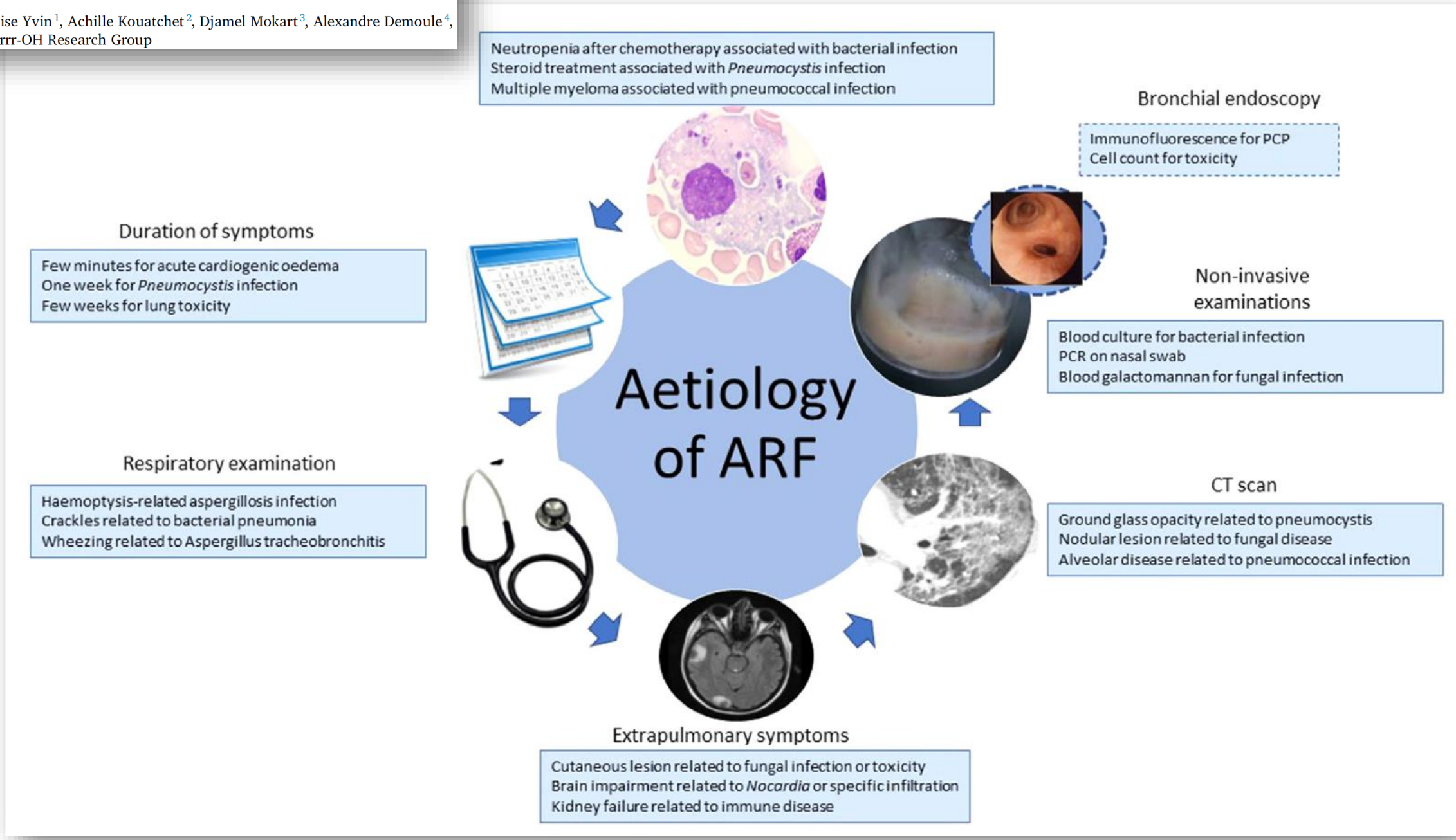
Lancet Respir Med 2019; 7: 173–86

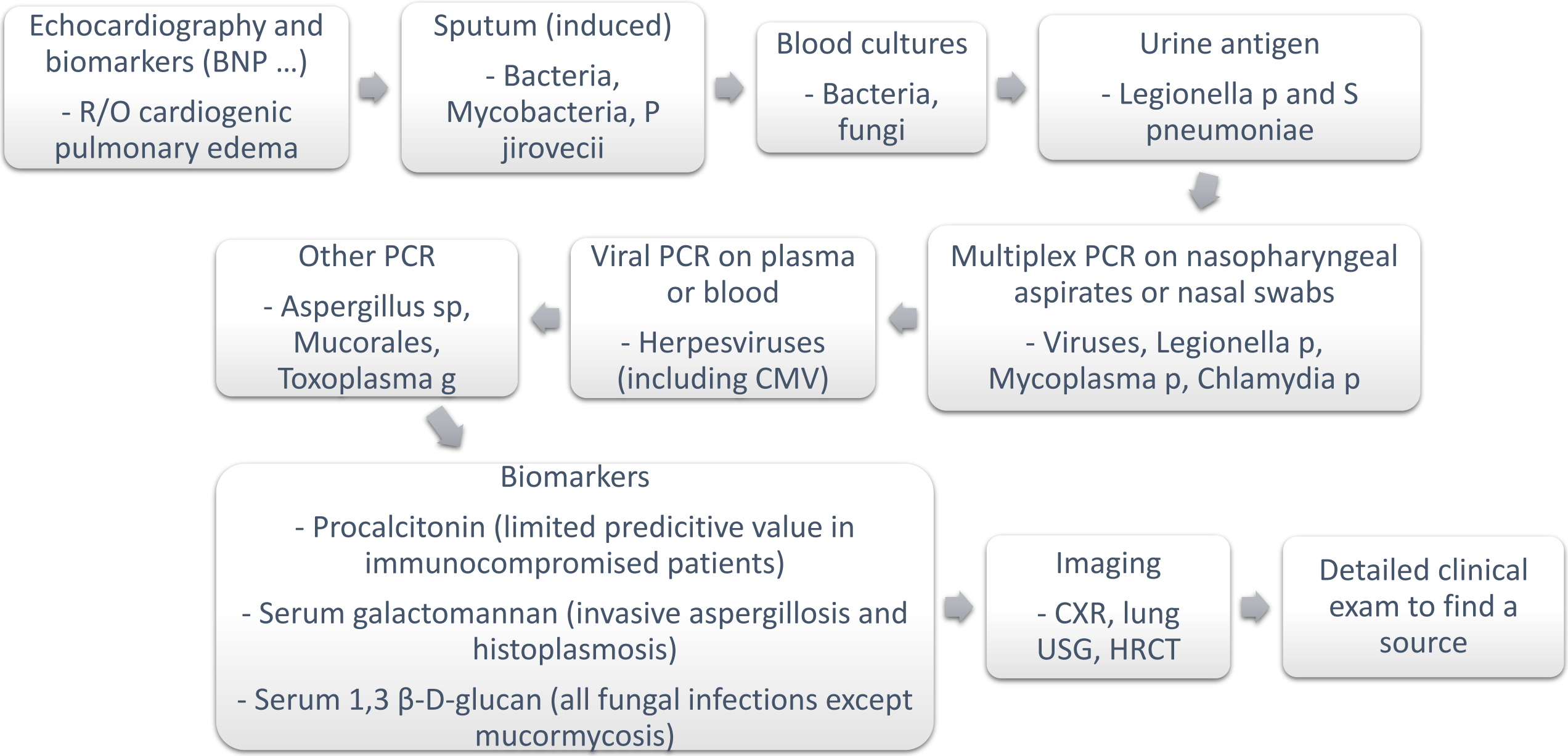
Oxygenation strategy during acute respiratory failure in immunocompromised patients

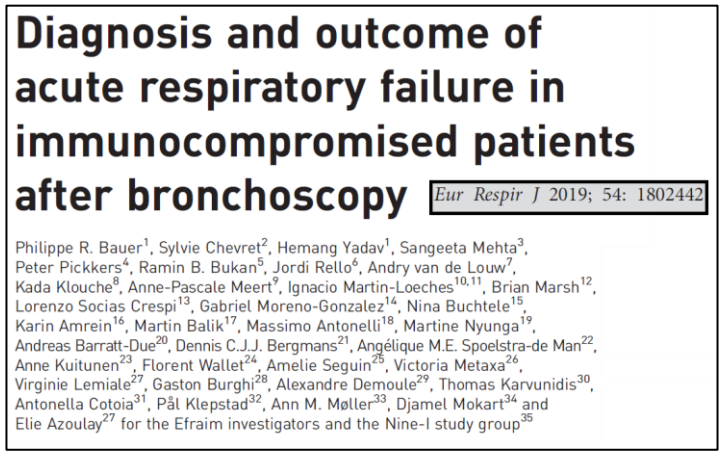
Journal of Intensive Medicine 1 (2021) 81–89

Virginie Lemiale [1,*], Elise Yvin [1], Achille Kouatchet [2], Djamel Mokart [3], Alexandre Demoule [4], Guillaume Dumas [1], Grrr-OH Research Group



Diagnostic algorithm



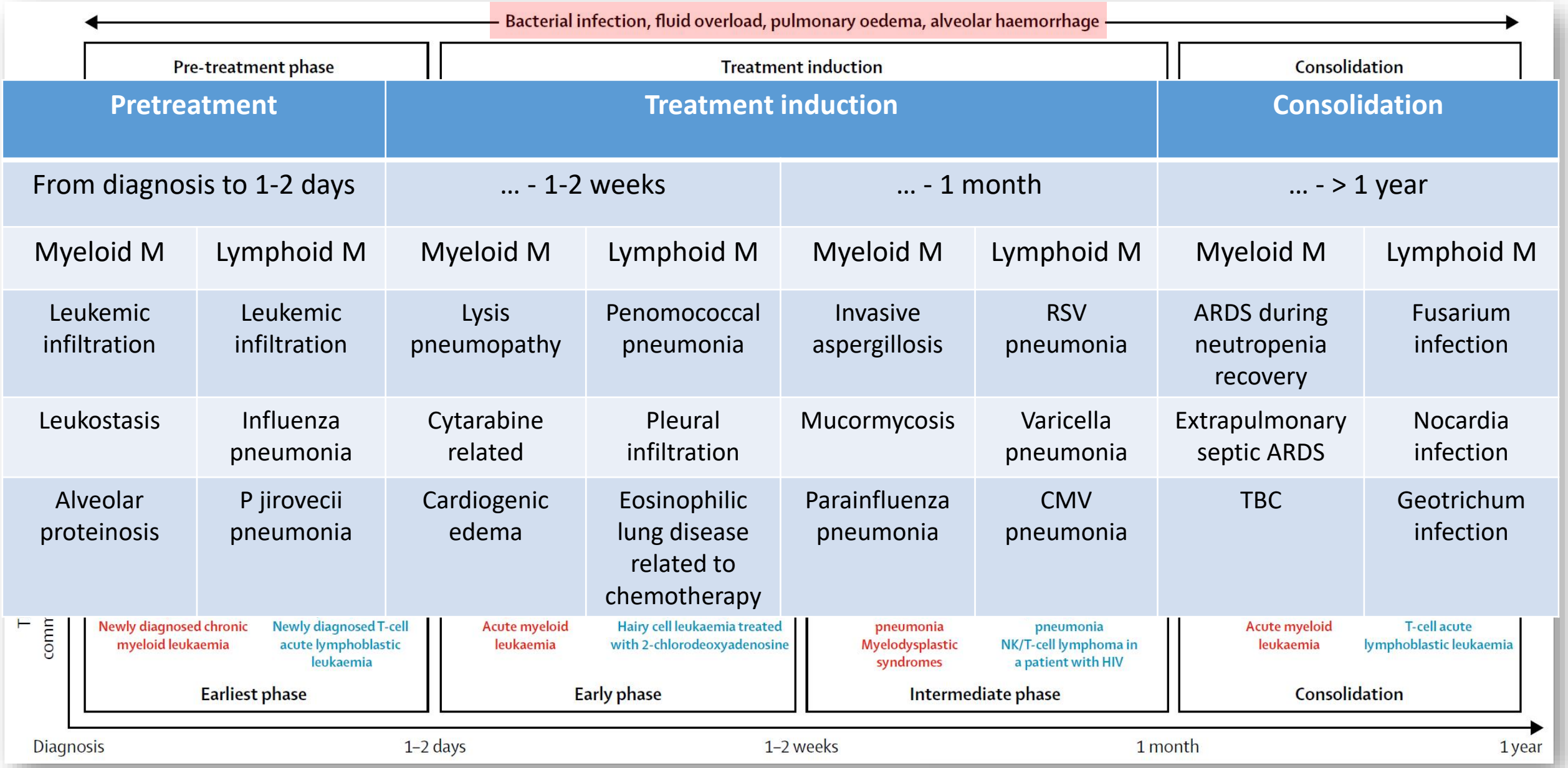


Diagnosis and outcome of acute respiratory failure in immunocompromised patients after bronchoscopy

Eur Respir J 2019; 54: 1802442

Philippe R. Bauer[1], Sylvie Chevret[2], Hemang Yadav[1], Sangeeta Mehta[3], Peter Pickkers[4], Ramin B. Bukan[5], Jordi Rello[6], Andry van de Louw[7], Kada Klouche[8], Anne-Pascale Meert[9], Ignacio Martin-Loeches[10,11], Brian Marsh[12], Lorenzo Socias Crespi[13], Gabriel Moreno-Gonzalez[14], Nina Buchtele[15], Karin Amrein[16], Martin Balik[17], Massimo Antonelli[18], Martine Nyunga[19], Andreas Barratt-Due[20], Dennis C.J.J. Bergmans[21], Angélique M.E. Spoelstra-de Man[22], Anne Kuitunen[23], Florent Wallet[24], Amelie Seguin[25], Victoria Metaxa[26], Virginie Lemiale[27], Gaston Burghi[28], Alexandre Demoule[29], Thomas Karvunidis[30], Antonella Cotoia[31], Pål Klepstad[32], Ann M. Møller[33], Djamel Mokart[34] and Elie Azoulay[27] for the Efraim investigators and the Nine-I study group[35]

- **Performed in 39% of patients** who had mostly hematological malignancy and a higher severity of illness score
- Achieved a **diagnosis in 27%** of patients and resulted in a **management change in 38%** of patients
- Associated with **worsening of respiratory status in 11%** of patients
- Rate of **undiagnosed causes was 13%**
- Associated with **higher ICU (40% vs 28%; p<0.0001) and hospital mortality (49% vs 41%; p=0.003)**
- Associated with **increased risk of hospital mortality (OR 1.4 [1.1–1.8] after propensity score matching**



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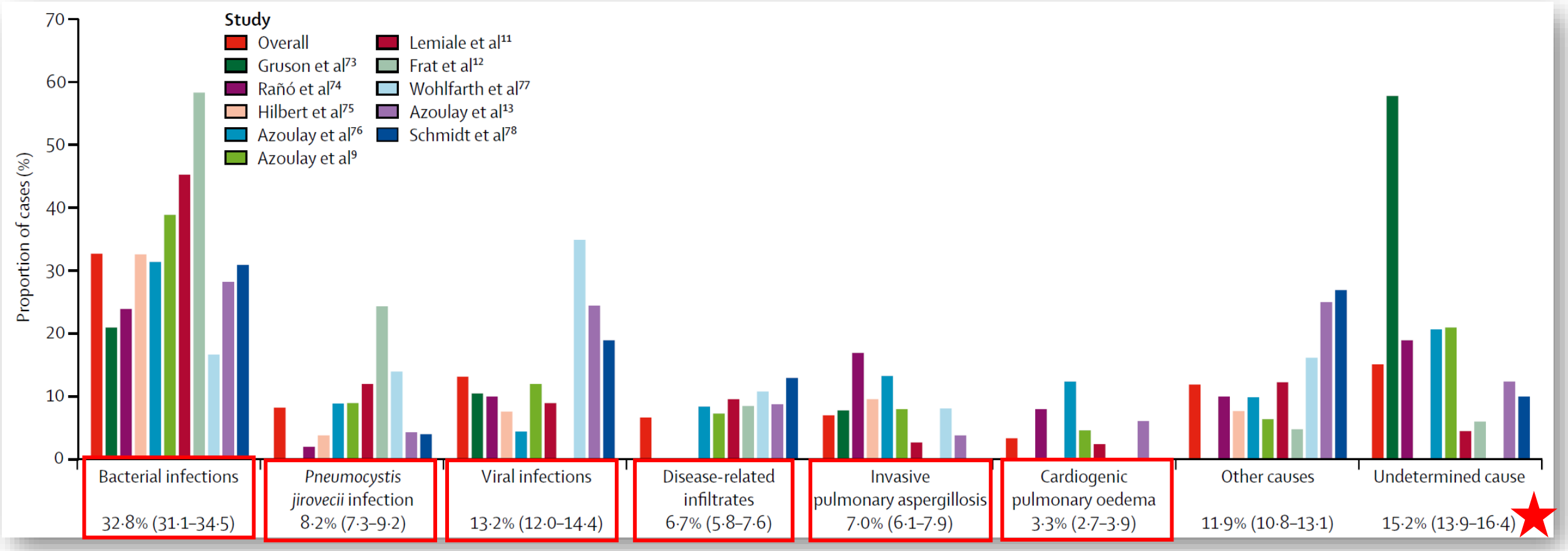

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Diagnosis of severe respiratory infections in immunocompromised patients

Intensive Care Med (2020) 46:

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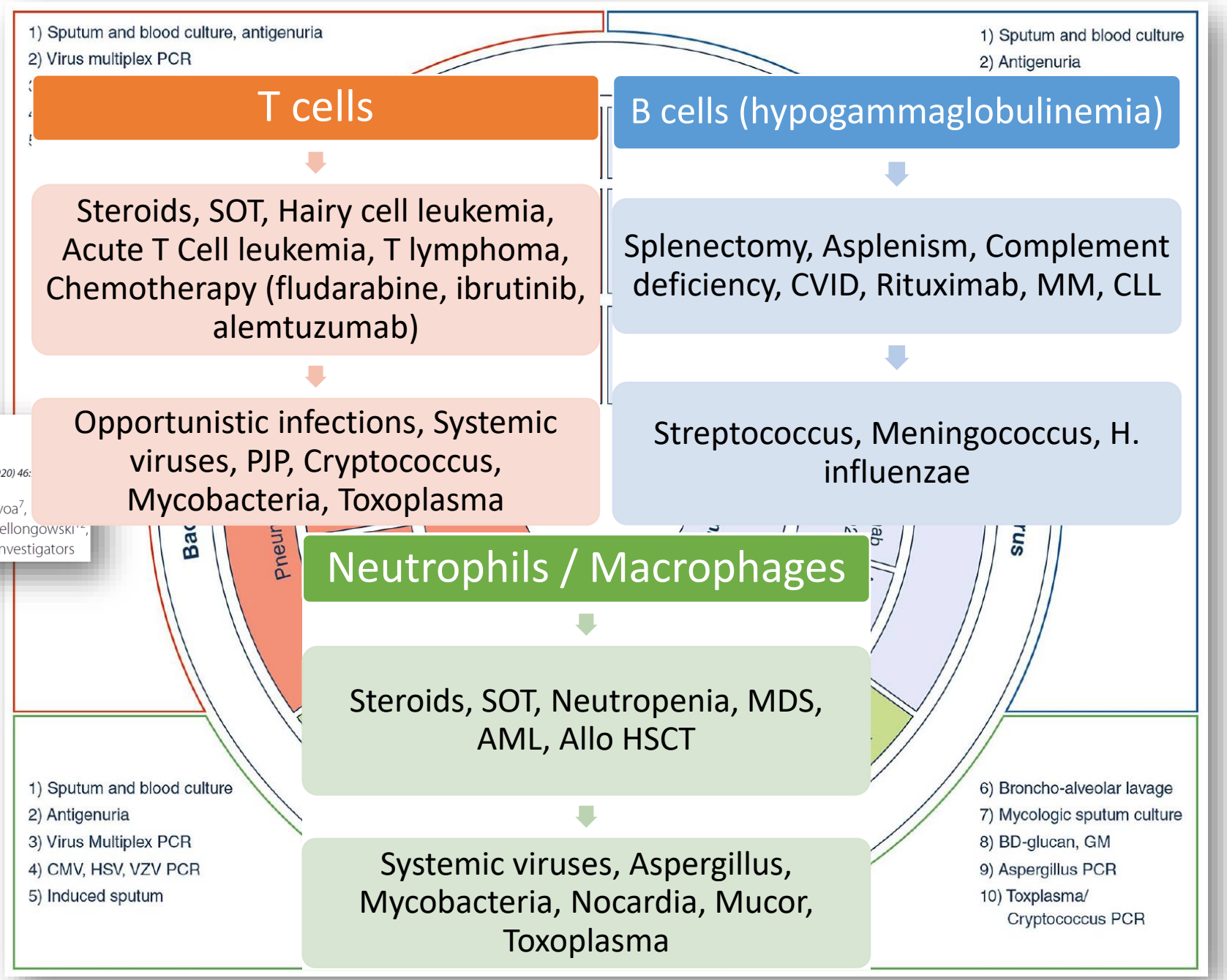

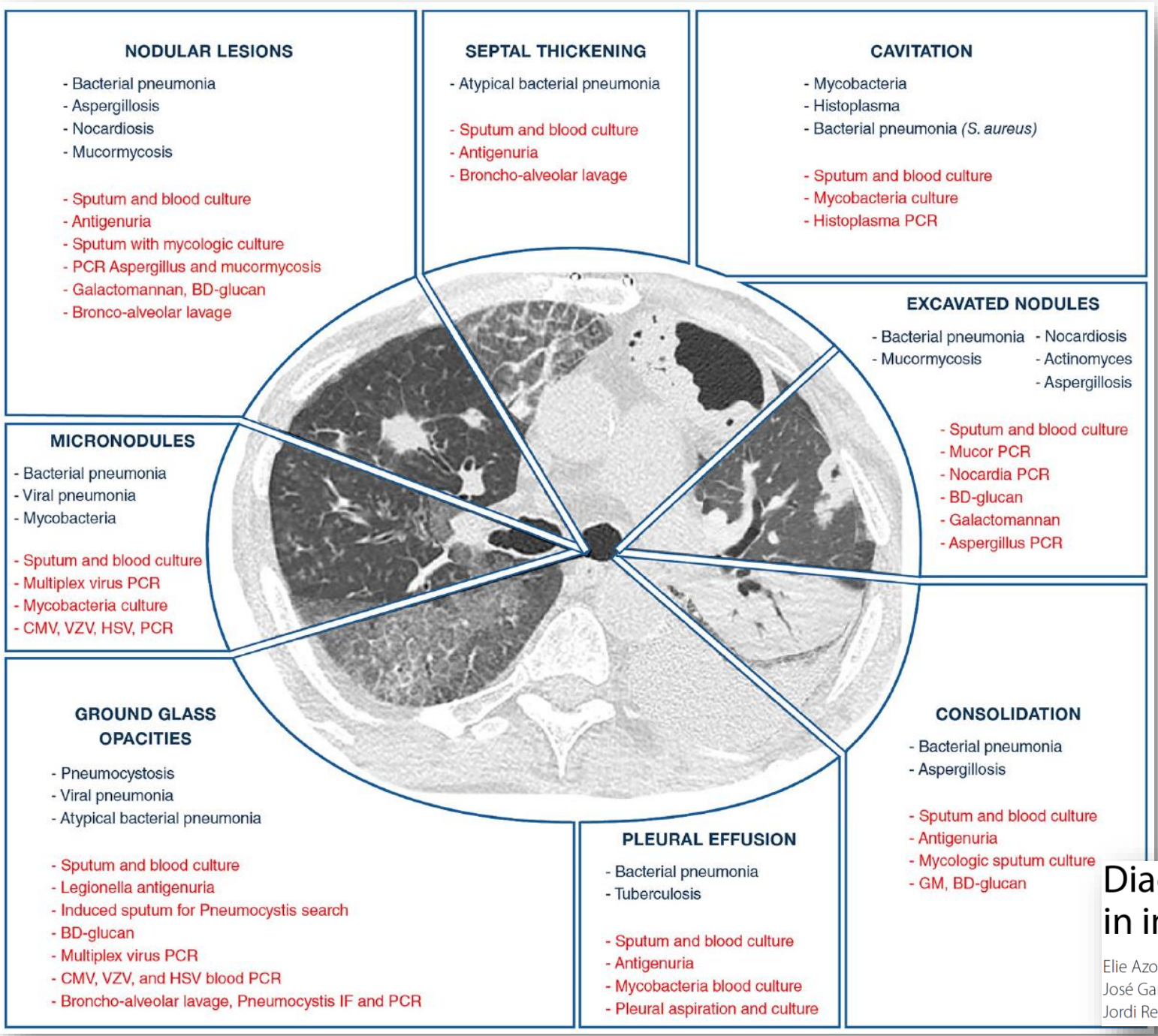

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Table 3 Community-acquired respiratory virus (CARV)

Type	Family	Genus	Virus
RNA viruses	Orthomyxoviridae	*Influenza A*	All Influenza A subtypes
		Influenza B	Influenza B
	Paramyxoviridae	*Rubulavirus*	Human parainfluenza virus type 2 (PIV-2) Human parainfluenza virus type 4a (PIV-4a) Human parainfluenza virus type 4b (PIV-4b)
		Respirovirus	Human parainfluenza virus type 1 (PIV-1) Human parainfluenza virus type 3 (PIV-3)
	Pneumoviridae	*Metapneumovirus*	Human metapneumovirus (hMPV)
		Orthopneumovirus	Human orthopneumovirus/Respiratory syncytial virus A (RSV-A) Human orthopneumovirus/Respiratory syncytial virus B (RSV-B)
	Coronaviridae	*Betacoronavirus*	Middle East respiratory syndrome-related coronavirus (MERS-CoV) Severe acute respiratory syndrome-related coronavirus (SARS-CoV) Human coronavirus NL63 Human coronavirus 229E Human coronavirus HKU1 Human coronavirus OC43
	Picornaviridae	*Enterovirus*	Enterovirus A-L Rhinovirus A, B, C

Table 4 Systemic viruses responsible for pneumonia in immunocompromised patients

Virus type	Source	Extra-respiratory manifestations	Diagnosis
HSV (HSV-1, HSV-2)	Donor transmission to transplant recipient Reactivation in T-cell defects	Skin and genital eruption Encephalitis, esophagitis, Keratitis	PCR (blood, BAL, tissue) Tissue culture Serology Histopathology
VZV	Donor transmission to transplant recipient Reactivation in T-cell defects	Varicella, herpes zoster Encephalitis, cerebellitis, hepatitis, myelitis Herpes zoster ophthalmicus	PCR Direct fluorescent antibody testing Viral culture Histopathology
CMV	Donor transmission to transplant recipient Reactivation in T-cell defects	Esophagitis, gastritis, colitis Retinitis, encephalitis, myelitis, polyradiculopathy Neutropenia	PCR (blood, BAL) Histopathology Serology
Adenovirus	Reactivation	Hemorrhagic cystitis, nephritis Colitis, hepatitis, encephalitis	Viral culture (nasal, blood, urine, CSF, tissues) EIA, Immunofluorescence, PCR, serology Histopathology

Diagnosis of severe respiratory infections in immunocompromised patients

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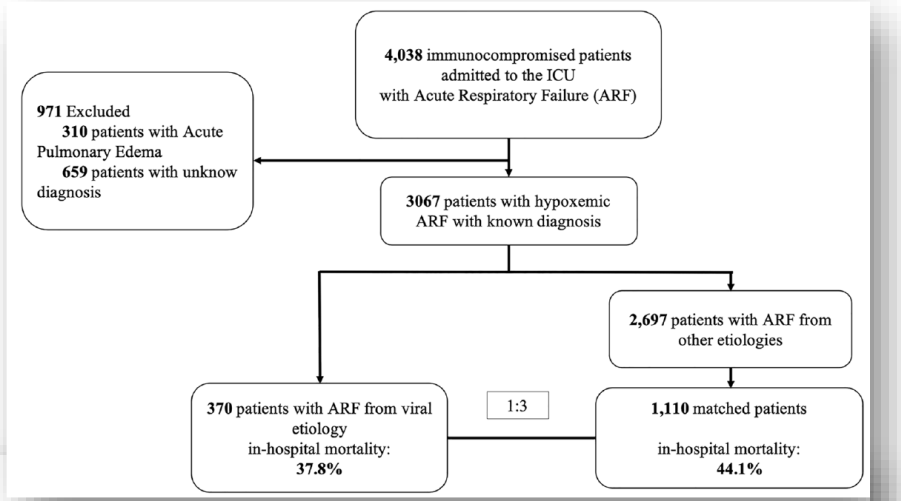
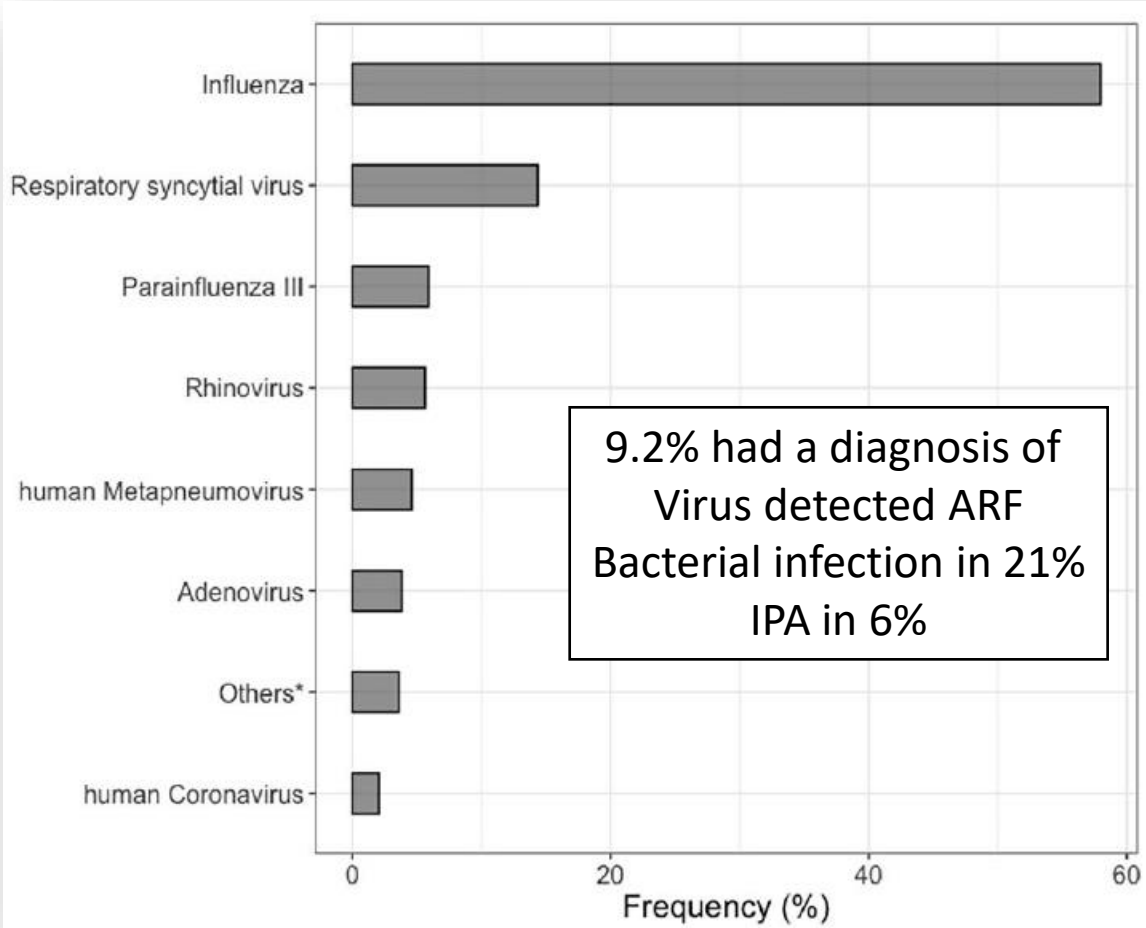
Prognosis of critically ill immunocompromised patients with virus-detected acute respiratory failure

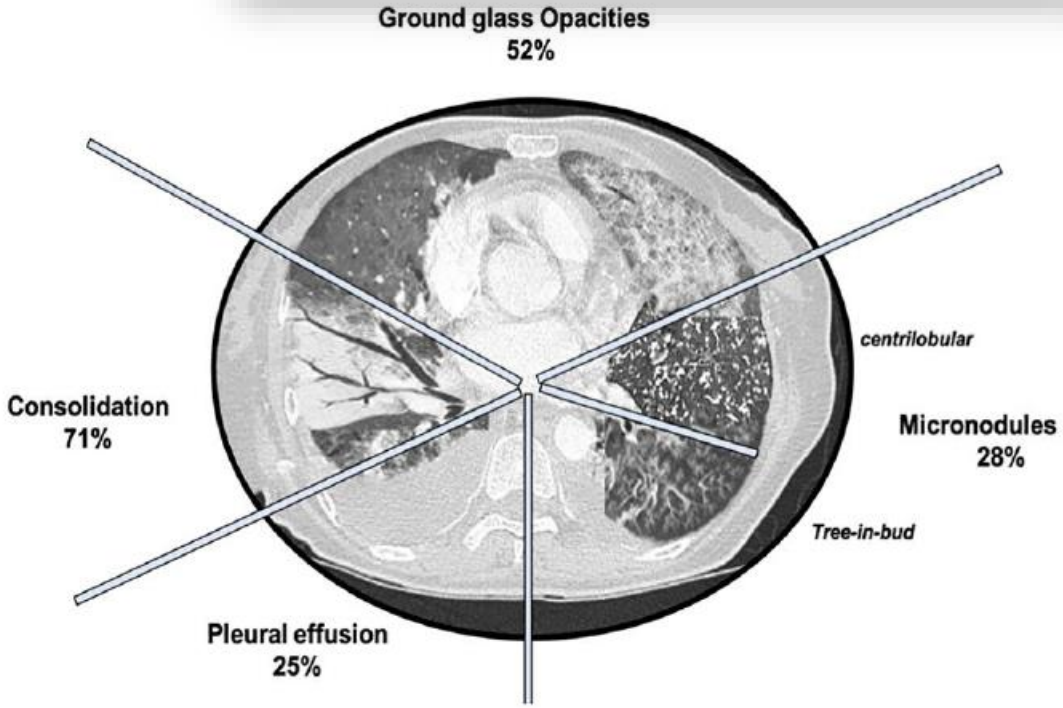
Guillaume Dumas[1*], Maxime Bertrand[2,3], Virginie Lemiale[2,3], Emmanuel Canet[4], François Barbier[5], Achille Kouatchet[6], Alexandre Demoule[7], Kada Klouche[8], Anne-Sophie Moreau[9], Laurent Argaud[10], Florent Wallet[11], Jean-Herlé Raphalen[12], Djamel Mokart[13], Fabrice Bruneel[14], Frédéric Pène[15,16] and Elie Azoulay[2,3]

Annals of Intensive Care (2023) 13:101





9.2% had a diagnosis of Virus detected ARF
Bacterial infection in 21%
IPA in 6%



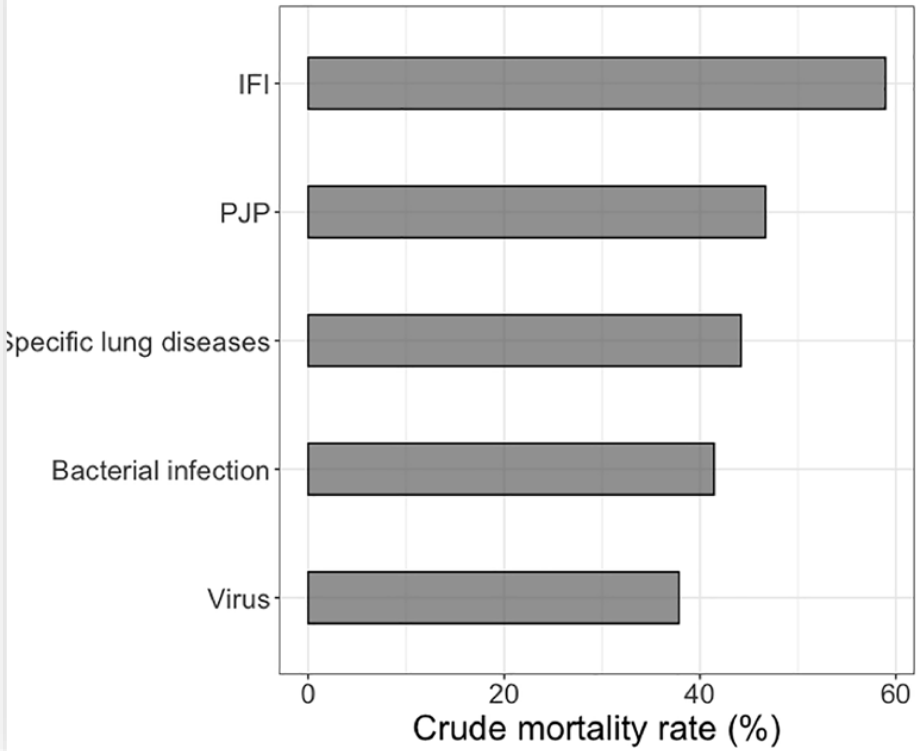
Prognosis of critically ill immunocompromised patients with virus-detected acute respiratory failure

Guillaume Dumas[1*], Maxime Bertrand[2,3], Virginie Lemiale[2,3], Emmanuel Canet[4], François Barbier[5], Achille Kouatchet[6], Alexandre Demoule[7], Kada Klouche[8], Anne-Sophie Moreau[9], Laurent Argaud[10], Florent Wallet[11], Jean-Herlé Raphalen[12], Djamel Mokart[13], Fabrice Bruneel[14], Frédéric Pène[15,16] and Elie Azoulay[2,3]

Annals of Intensive Care (2023) 13:101

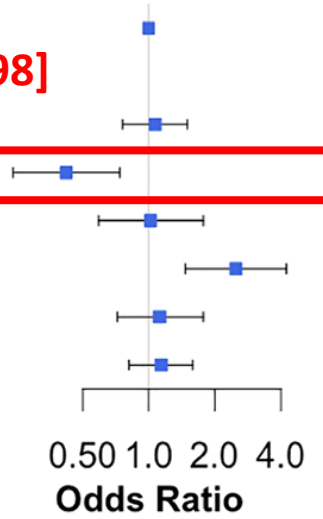
Crude in-hospital mortality rate 38%

A



B

Covariates	OR [95%CI]	p-value
Bacterial infection	Ref.	
Virus	**0.77, CI [0.60–0.98]**	
Influenza	0.99 [0.72-1.36]	0.95
Influenza-like*	0.54 [0.33-0.88]	0.01
Others	0.98 [0.58-1.65]	0.94
IFI	2.06 [1.32-3.21]	<0.001
PJP	1.24 [0.83-1.84]	0.30
Specific lung diseases	1.12 [0.83-1.51]	0.45



*RSV, parainfluenza, hMPV

Invasive fungal infections

- *Pneumocystis jirovecii*
- *Aspergillus* spp
- *Cryptococcus* spp
- *Mucorales*
- *Fusarium*

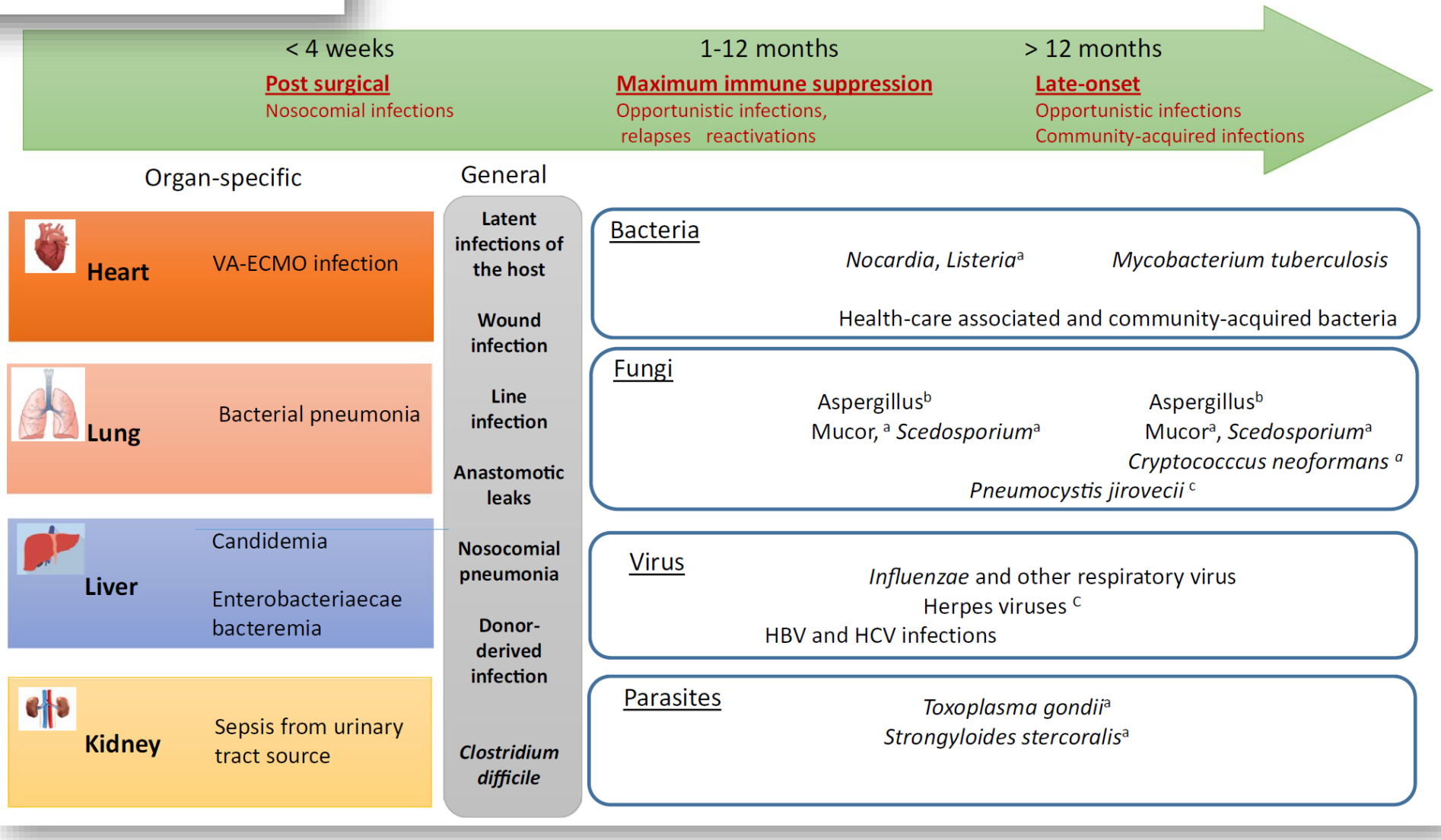
Parasitic infections

- *Toxoplasma gondii*
- *Strongyloides stercoralis*

Diagnostic and therapeutic approach to infectious diseases in solid organ transplant recipients

Intensive Care Med (2019) 45:573–591

Jean-François Timsit[1,2*], Romain Sonneville[3,4], Andre C. Kalil[5], Matteo Bassetti[6], Ricard Ferrer[7], Samir Jaber[8], Fanny Lanternier[9,10], Charles-Edouard Luyt[11,12], Flavia Machado[13], Malgorzata Mikulska[14], Laurent Papazian[15], Fréderic Pène[16,17], Garyphalia Poulakou[18], Claudio Viscoli[14], Michel Wolff[19], Lara Zafrani[20] and Christian Van Delden[21]



a low incidence

b high incidence in lung Tx

c high incidence if no prophylaxis

Oxygenation and ventilation

- Earlier studies have shown higher mortality in immunocompromised patients who required IMV.
- However, more recent studies have revealed that failure of NIV or HFNO was associated with higher mortality, and even that early IMV was associated with improved survival, as IMV is a reflection of disease severity.

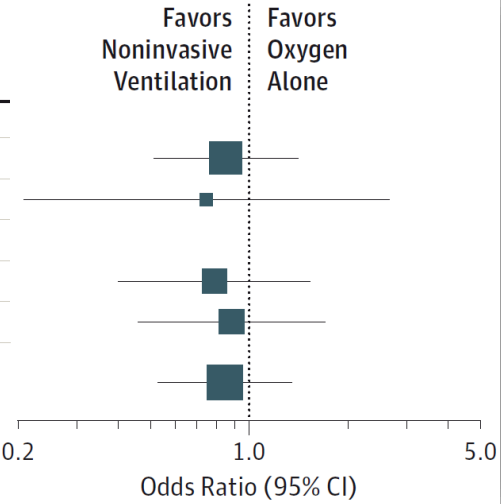
Effect of Noninvasive Ventilation vs Oxygen Therapy on Mortality Among Immunocompromised Patients With Acute Respiratory Failure

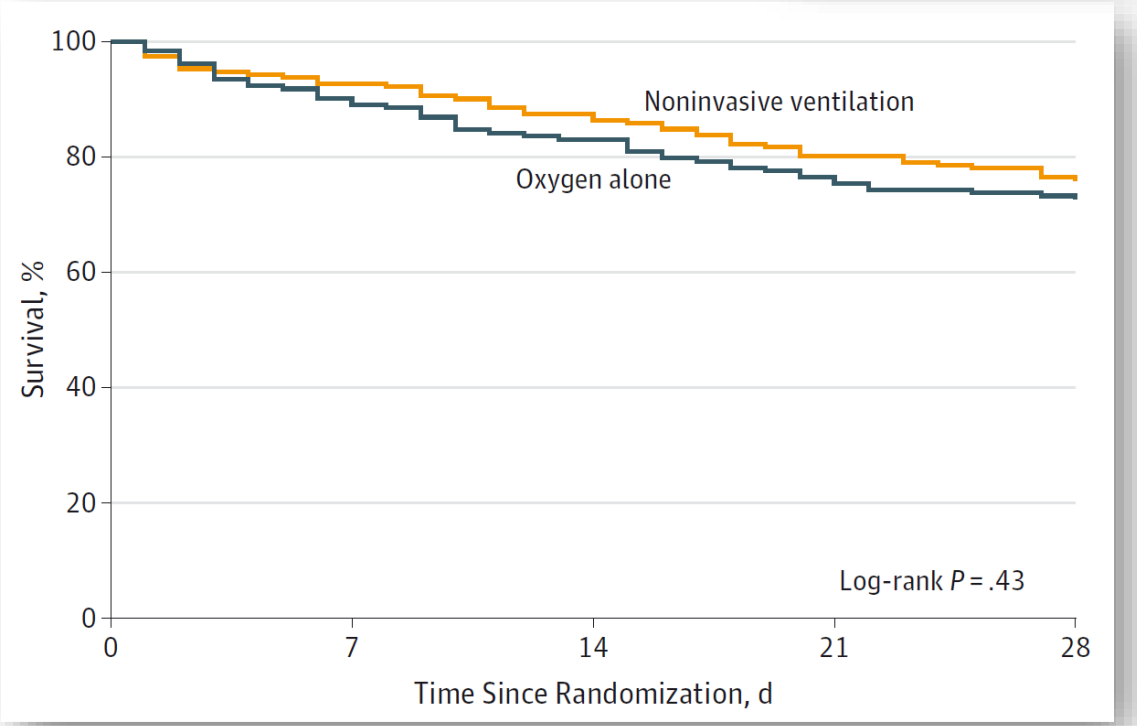
A Randomized Clinical Trial

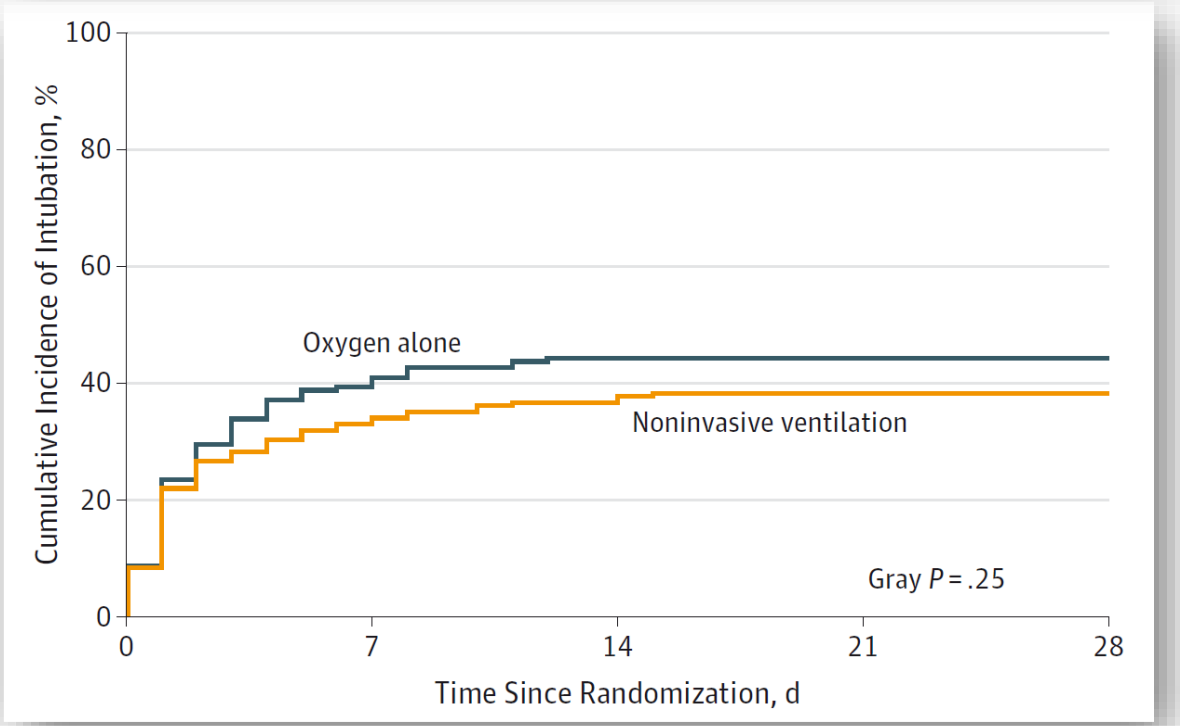
JAMA. 2015;314(16):1711-1719.

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)

Source	No. of Deaths/Total No. Oxygen Alone	Noninvasive Ventilation	Odds Ratio (95% CI)
Underlying Conditions			
Solid tumors or hematologic malignancies	43/150	41/161	0.85 (0.51-1.40)
Immunosuppressive treatment or organ transplant	7/33	5/30	0.74 (0.2-2.63)
Oxygen flow at randomization[b]			
>9 L/min	26/77	24/84	0.78 (0.4-1.53)
≤9 L/min	24/106	22/107	0.88 (0.46-1.70)
All patients	50/183	46/191	0.84 (0.53-1.34)





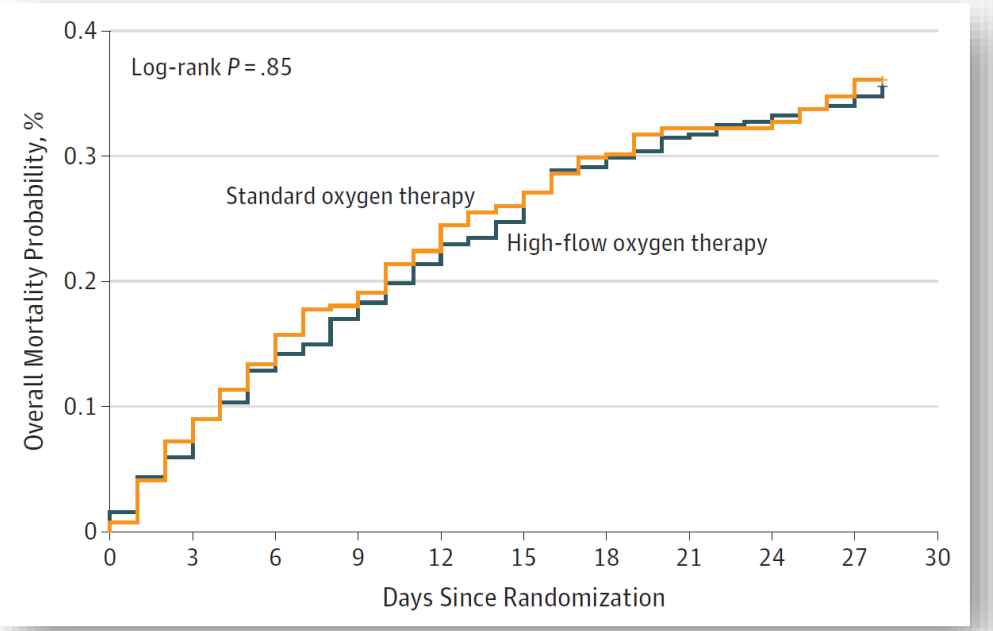


Effect of High-Flow Nasal Oxygen vs Standard Oxygen on 28-Day Mortality in Immunocompromised Patients With Acute Respiratory Failure

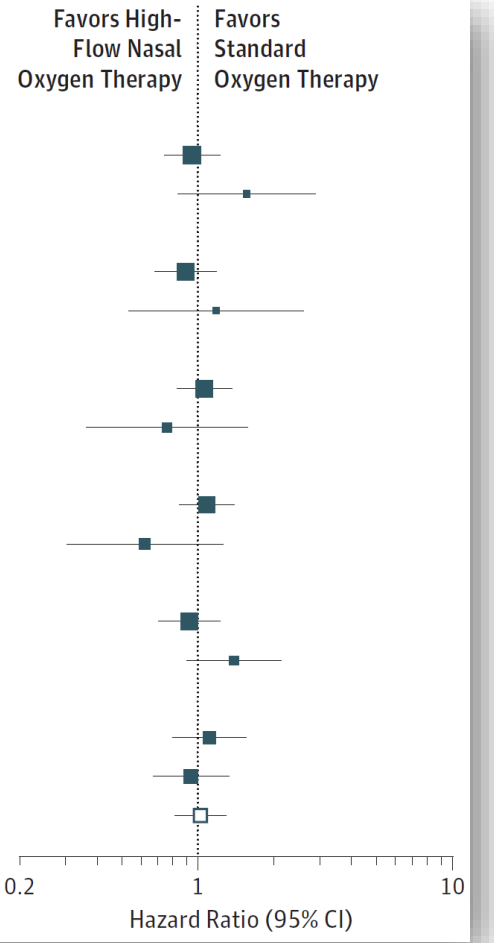
The HIGH Randomized Clinical Trial

JAMA. 2018;320(20):2099-2107.

Elie Azoulay, MD, PhD; Virginie Lemiale, MD; Djamel Mokart, MD, PhD; Saad Nseir, MD, PhD; Laurent Argaud, MD, PhD; Frédéric Pène, MD, PhD; Loay Kontar, MD; Fabrice Bruneel, MD; Kada Klouche, MD, PhD; François Barbier, MD, PhD; Jean Reignier, MD, PhD; Lilia Berrahil-Meksen, MD; Guillaume Louis, MD; Jean-Michel Constantin, MD, PhD; Julien Mayaux, MD; Florent Wallet, MD; Achille Kouatchet, MD; Vincent Peigne, MD; Igor Théodose, MS; Pierre Perez, MD; Christophe Girault, MD; Samir Jaber, MD, PhD; Johanna Oziel, MD; Martine Nyunga, MD; Nicolas Terzi, MD, PhD; Lila Bouadma, MD, PhD; Christine Lebert, MD; Alexandre Lautrette, MD, PhD; Naike Bigé, MD, PhD; Jean-Herlé Raphalen, MD; Laurent Papazian, MD, PhD; Michael Darmon, MD, PhD; Sylvie Chevret, MD, PhD; Alexandre Demoule, MD, PhD



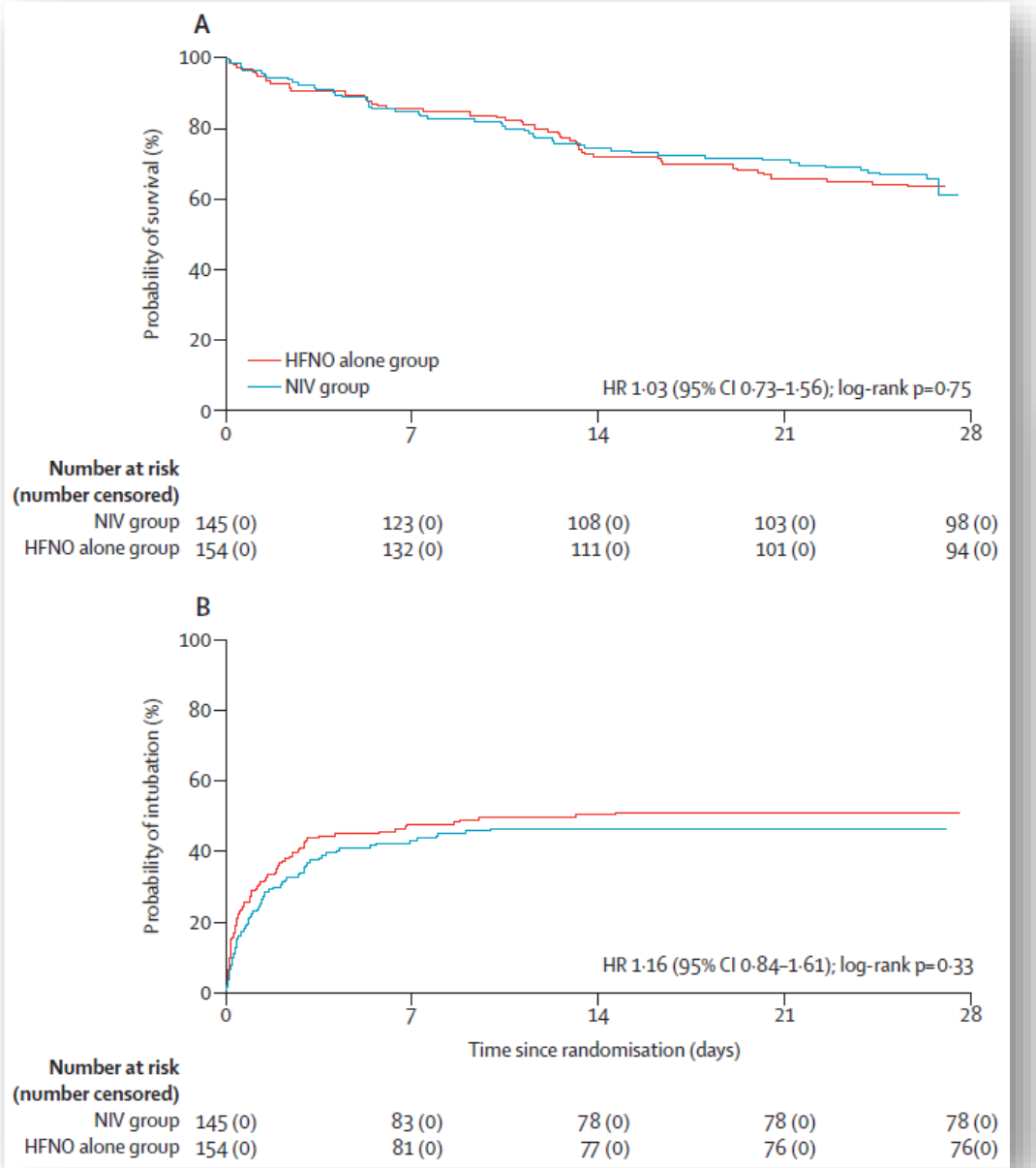
Subset	Deaths at Day 28/Total No. of Patients: High-Flow Nasal Oxygen Therapy	Deaths at Day 28/Total No. of Patients: Standard Oxygen Therapy	Hazard Ratio (95% CI)
ICU admission to randomization, d			
0-1	120/321	118/330	0.95 (0.74-1.22)
≥2	18/67	22/58	1.55 (0.83-2.90)
Pao_2: FIo_2 ratio			
<200	99/237	95/251	0.89 (0.68-1.19)
≥200	16/65	10/35	1.18 (0.54-2.60)
Oxygen flow at randomization, L/min			
≤9	122/348	127/347	1.06 (0.83-1.36)
>9	16/40	13/41	0.76 (0.36-1.57)
Catecholamines			
No	121/355	126/349	1.08 (0.84-1.39)
Yes	17/33	14/39	0.62 (0.31-1.26)
Unknown diagnosis			
No	99/297	95/303	0.93 (0.70-1.23)
Yes	39/91	45/85	1.39 (0.90-2.13)
Hematologic malignancy			
No	66/199	72/198	1.11 (0.79-1.55)
Yes	64/167	65/181	0.94 (0.67-1.33)
All patients	138/388	140/388	1.02 (0.81-1.29)

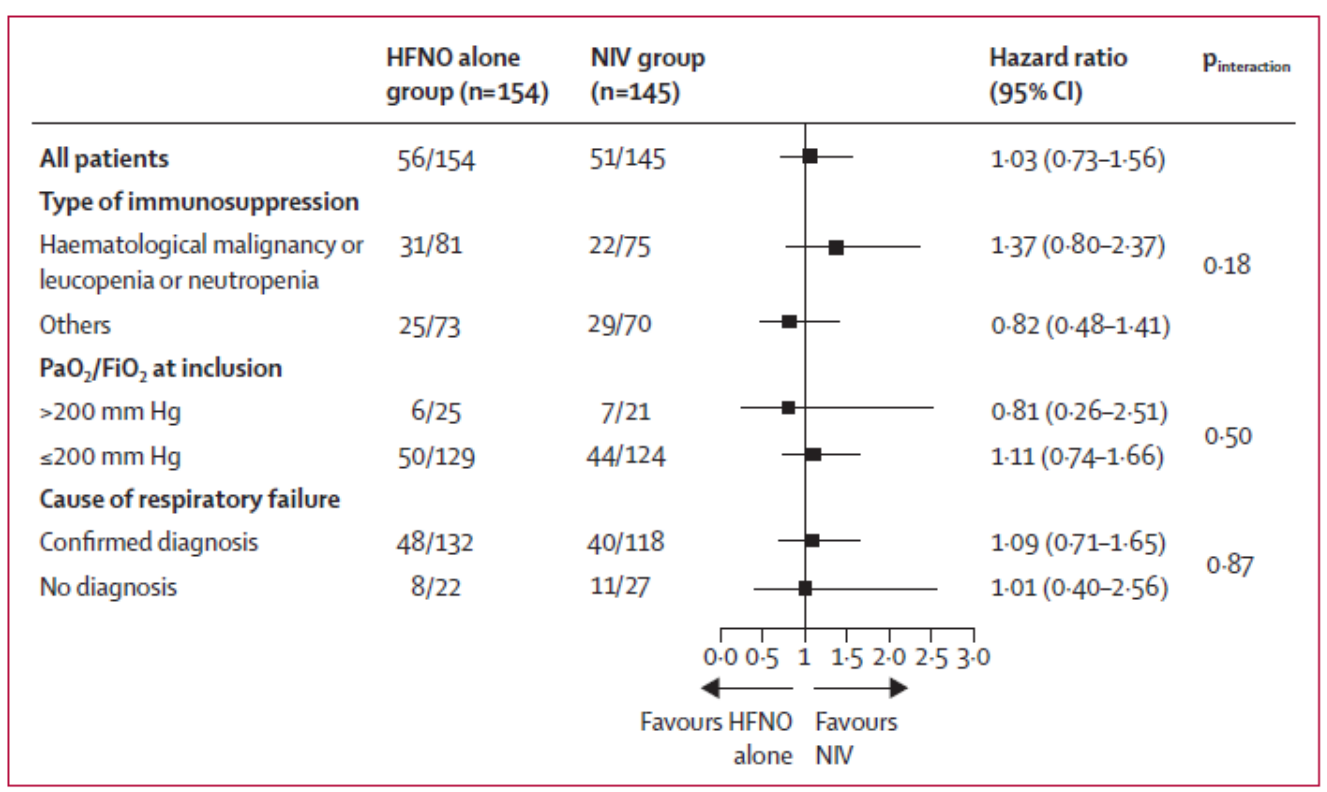


High-flow nasal oxygen alone or alternating with non-invasive ventilation in critically ill immunocompromised patients with acute respiratory failure: a randomised controlled trial

Lancet Respir Med 2022; 10: 641–49

*Rémi Coudroy, Jean-Pierre Frat, Stephan Ehrmann, Frédéric Pène, Maxens Decavèle, Nicolas Terzi, Gwenaël Prat, Charlotte Garret, Damien Contou, Arnaud Gacouin, Jeremy Bourenne, Christophe Girault, Christophe Vinsonneau, Jean Dellamonica, Guylaine Labro, Sébastien Jochmans, Alexandre Herbland, Jean-Pierre Quenot, Jérôme Devaquet, Dalila Benzekri, Emmanuel Vivier, Saad Nseir, Gwenhaël Colin, Didier Thevenin, Giacomo Grasselli, David Bougon, Mona Assefi, Claude Guérin, Thierry Lherm, Achille Kouatchet, Stephanie Ragot, Arnaud W Thille, for the FLORALI-IM study group and the REVA Research Network**

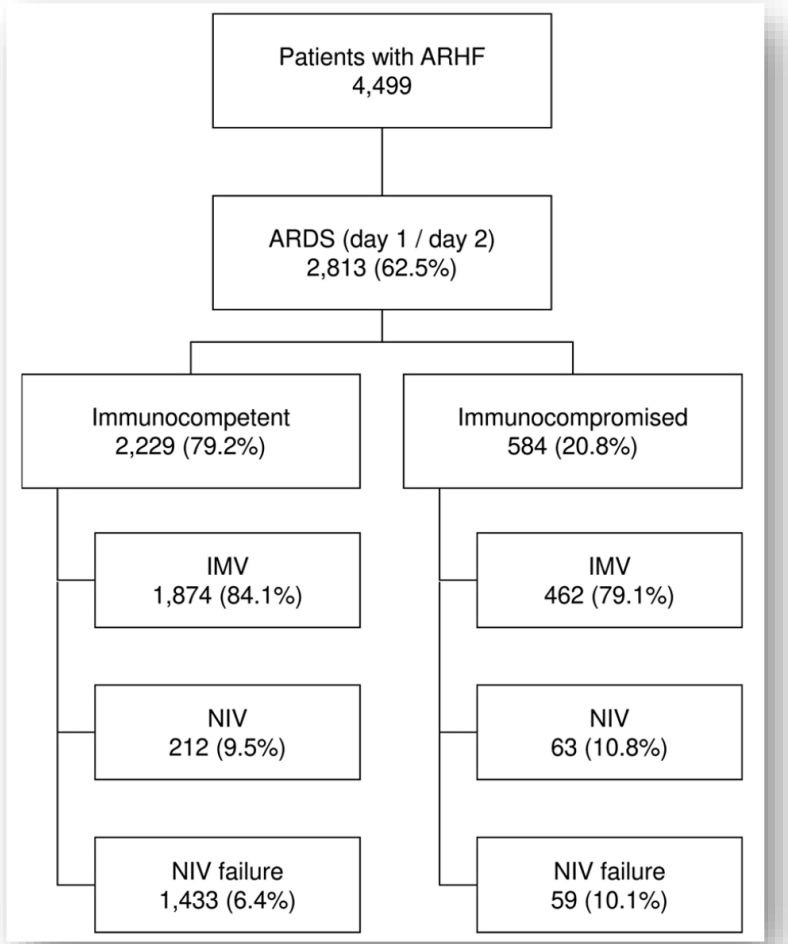


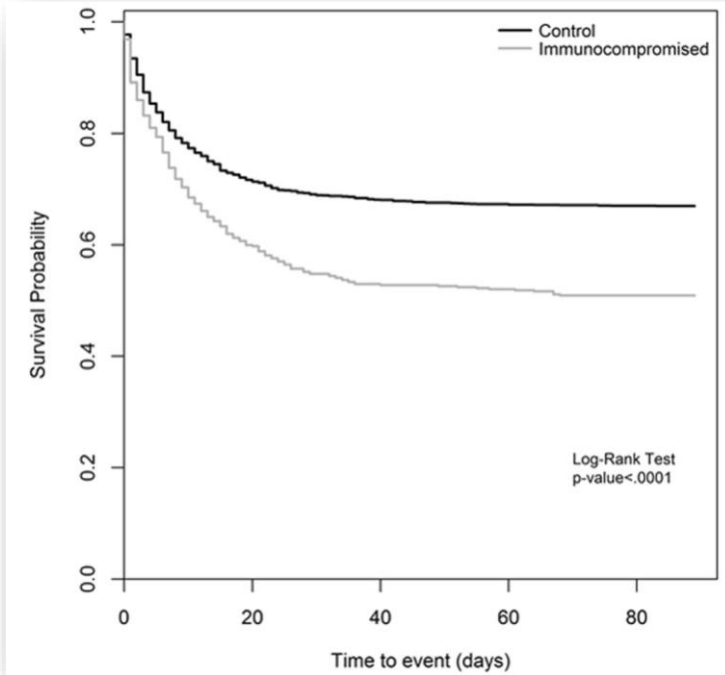


Immunocompromised patients with acute respiratory distress syndrome: secondary analysis of the LUNG SAFE database

Critical Care (2018) 22:157

Andrea Cortegiani[1*], Fabiana Madotto[2], Cesare Gregoretti[1], Giacomo Bellani[3,4], John G. Laffey[5,6,7], Tai Pham[6,7], Frank Van Haren[8,9], Antonino Giarratano[1], Massimo Antonelli[10], Antonio Pesenti[11,12], Giacomo Grasselli[11], LUNG SAFE Investigators and the ESICM Trials Group





	Control ($n = 2229$)	Study ($n = 584$)	*p* Value
ICU mortality[b], *n* (%)	698 (31.3)	266 (45.5)	**< 0.0001**
Hospital mortality[c], *n* (%)			
All patients	804 (36.2)	304 (52.4)	**< 0.0001**

	IMV ($n = 462$)	NIV ($n = 63$)	NIV failure ($n = 59$)	*p* Value
ICU mortality[d], *n* (%)	214 (46.3)	18 (28.6)[b]	34 (57.6)[c]	**0.0043**
Hospital mortality[e], *n* (%)				
All patients	242 (52.8)	25 (39.7)	37 (62.7)[c]	**0.0362**

Survival in Immunocompromised Patients Ultimately Requiring Invasive Mechanical Ventilation

Am J Respir Crit Care Med Vol 204, Iss 2, pp 187–196, Jul 15, 2021

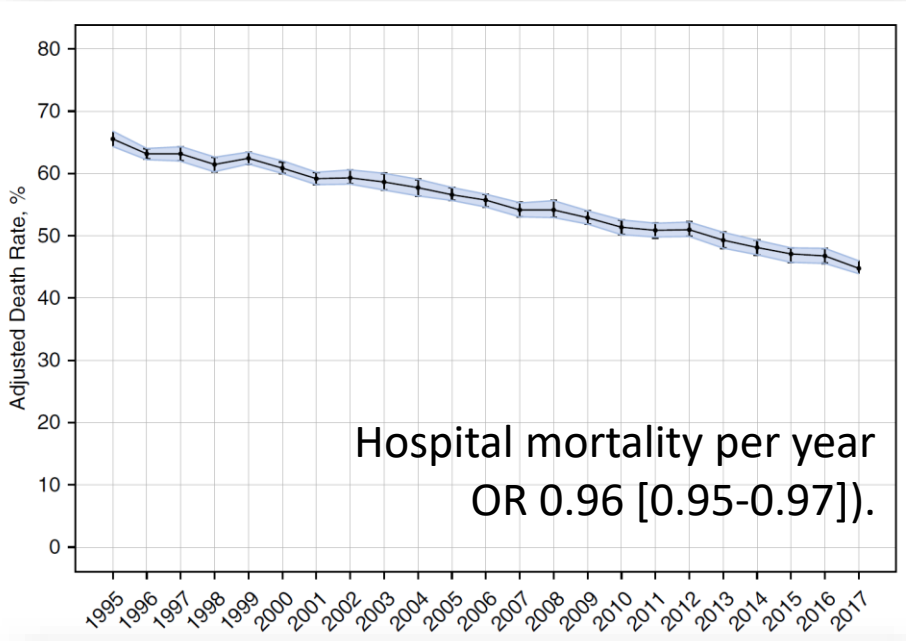
A Pooled Individual Patient Data Analysis

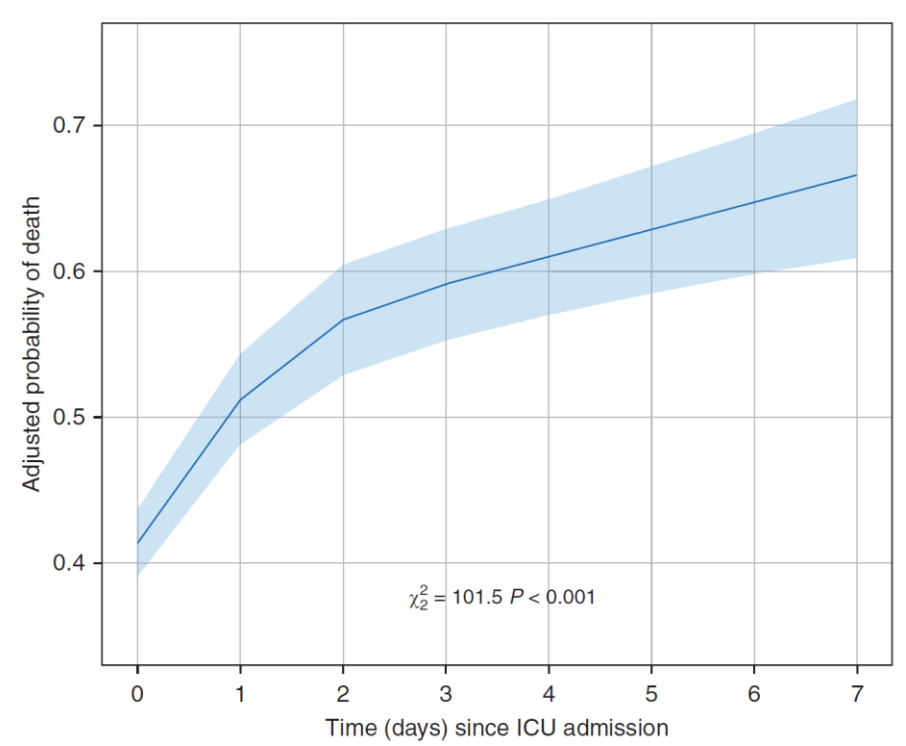
Guillaume Dumas[1,2], Virginie Lemiale[1,2], Nisha Rathi[3], Andrea Cortegiani[4], Frédéric Pène[5], Vincent Bonny[1,2], Jorge Salluh[6], Guillermo M. Albaiceta[7,8], Marcio Soares[6], Ayman O. Soubani[9], Emmanuel Canet[10], Tarik Hanane[11], Achille Kouatchet[12], Djamel Mokart[13], Pia Lebiedz[14], Melda Türkoğlu[15], Rémi Coudroy[16,17], Kyeongman Jeon[18,19], Alexandre Demoule[20], Sangeeta Mehta[21], Pedro Caruso[22], Jean-Pierre Frat[16,17], Kuang-Yao Yang[23,24], Oriol Roca[8,25,26], John Laffey[27,28], Jean-François Timsit[29], Elie Azoulay[1,2], and Michael Darmon[1,2]

- 24 ICUs, 11,000+ pts
- 74% were intubated within 24 hours of ICU admission (early intubation)
- The crude mortality rate was 53%
- Mortality for **time from admission to intubation OR 1.38** [1.26-1.52]
- Mortality for **early intubation OR 0.83** [0.72-0.96]
- After propensity match, OR for **delayed intubation, 1.56** [1.44-1.70]

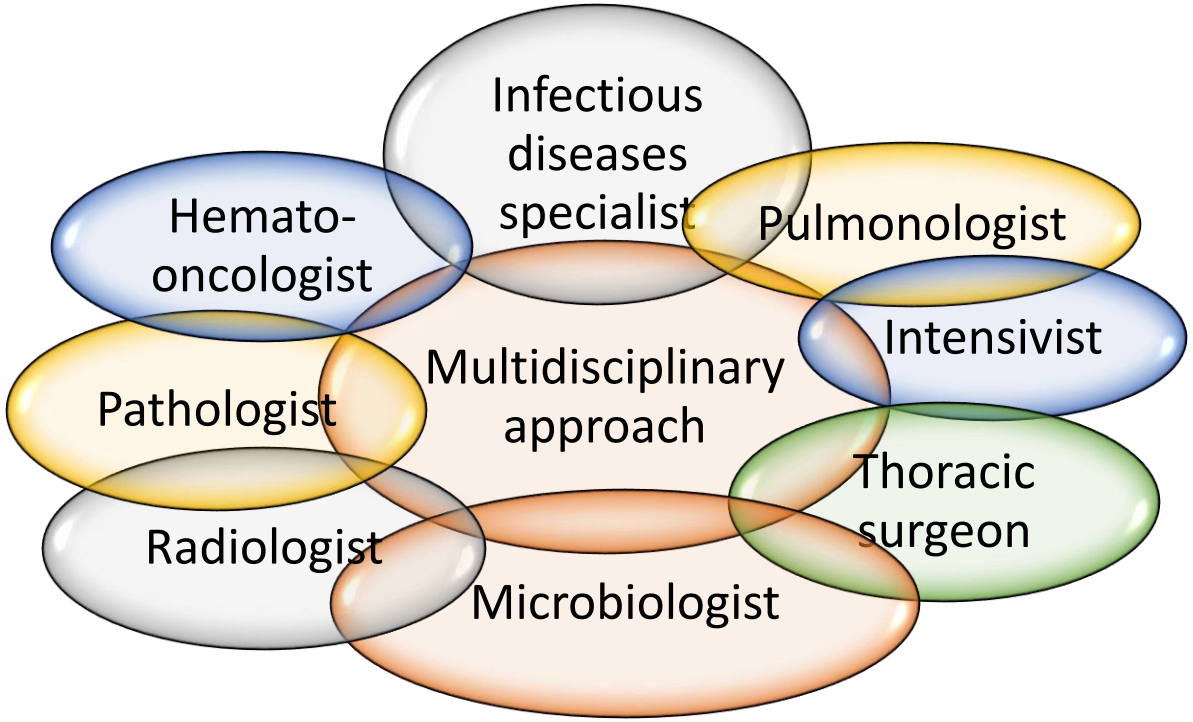
Table 2. Result of Regression Model Assessing Factors Independently Associated with Hospital Mortality, with Study as a Random Effect

	OR (95% CI)	*P* Value
Time to intubation, d*	1.38 (1.26–1.52)	<0.001
Age >60 yr	1.73 (1.56–1.92)	<0.001
Underlying disease		
Nonmalignant immunosuppression	Ref.	
Solid tumor	1.56 (1.34–1.81)	<0.001
Hematological malignancy	1.69 (1.38–2.05)	<0.001
Respiratory etiology undetermined	1.46 (1.10–1.94)	0.01
Pa_{O_2}/FI_{O_2}		
>300 mm Hg	Ref.	
200–299 mm Hg	1.32 (1.05–1.67)	0.02
100–199 mm Hg	1.56 (1.25–1.95)	<0.001
<100 mm Hg	2. 26 (1.79–2.85)	<0.001
Nonrespiratory SOFA score (by point)	1.22 (1.20–1.24)	<0.001
Year of admission	0.96 (0.95–0.97)	<0.001





In conclusion …



Try to avoid undetermined diagnosis !

Try to avoid delayed ICU admission !

Thank you …

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